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Fig. 1.

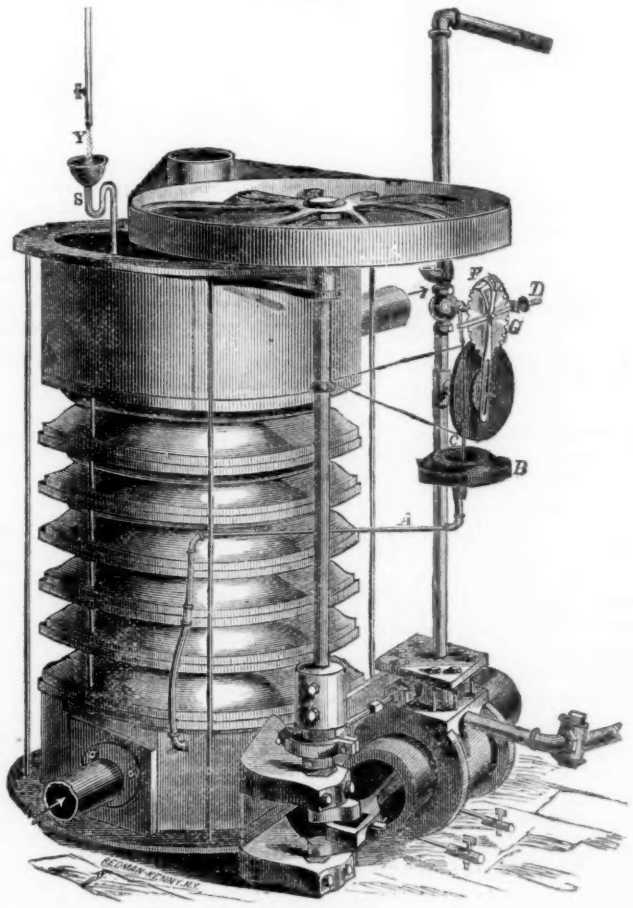
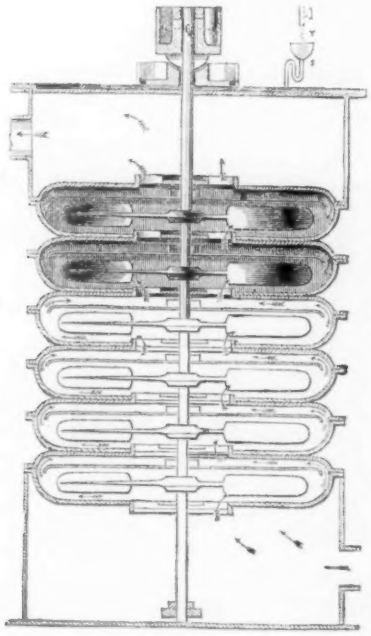


Fig. 2.



Clark's Combined Condenser, Scrubber and Exhauster.

[The syphon S having been omitted in the previous illustrations, in our issue of May 3rd, we herewith reproduce them with the corrections.]

The accompanying corrected illustrations of a recent improvement in gas machinery, exhibit a decided novelty.

Since the introduction of clay retorts, an exhauster has become a matter of necessity, and two or three makers of exhausters have in this country monopolized the manufacture of these machines. Some years since, Patrick Clark, the engineer of the Rahway (N. J.) Gas-Light Company, made some experiments on the subject of Centrifugal Exhausters, based on an improvement he had made on fan blowers, which were so successful that he was induced to follow up the matter, and the illustration on this page is the latest result of his experience. His improvement in Fan Blowers consists in constructing them in sections, in such a manner that the air or gas is acted upon successively by several fans, thereby reducing very much the speed they have to be run at, to attain the desired results. Applying the principle to a gas exhauster, it was found that it not only balanced the pressure of the holder, but it performed two other offices in gas making of the very first importance, viz.: It completely separates the tar and ammonia from the gas.

It is well known to those familiar with gas-making, that one of the greatest troubles incident to working a gas works up to its full capacity, is the passing of tar over into the purifiers, thereby destroying the purifying power of the lime, as well as obstructing the free flow of gas through it, and also the getting rid of the ammonia, without washing the gas to death.

The machine here illustrated performs both these duties in the most perfect manner, while at the same time it does the duties of an exhauster, thereby dispensing with the first cost of condensers and scrubbers, or supplementing them where they are found inadequate to the proper performance of their functions.

In the annexed illustration figure 1 is a perspective view of the exhauster, with a small steam engine attached to drive it; the respective arrows show the inlet and outlet of the gas. Attached to the steam pipe is a compensator or governor [known to millwrights and machinists as a mill governor, the governor balls being replaced by the vessel B, having

stretched across it a diaphragm (not shown). This diaphragm is connected by the rod C to the lever D, which lever when elevated causes the steam valve F to open, and when depressed causes it to close. It is also connected with the inlet or lower end of the exhauster by means of the pipe A, so that any tendency to a vacuum depresses it, and any tendency to a pressure elevates it, thereby causing the engine to run faster or slower as the gas tends to exert an upward or downward pressure on the diaphragm, and thereby keeping the condition of the gas, as regards pressure, on a perfect balance.

Now, if it performs the function above described, viz., that of an exhauster only, it might be said that we have a very excellent exhauster already in use, which serves that purpose well enough; but in addition, this machine is a perfect condenser.

This result is attained by the mechanical action of the fans running in the various sections shown in Fig. 2. It is now well understood that the separation of tar from gas is *not* due to *diminution of temperature*, but to the *gas impinging against solid surfaces*, which condition is perfectly fulfilled in this machine, as it comes successively in contact with six or more rapidly revolving fans, and is thereby completely separated from the gas. The ammonia is separated by means of the water flowing into the top of the machine through the syphon S, and travels downward in an opposite direction to the gas, and through the same passages which are indicated by the arrows in Fig. 2. The gas is brought in contact with the water while passing each other, by means of the rotary motion of the fans, the contact being so intimate as to almost entirely extract the ammonia, only a slight trace being left.

The machine is perfectly simple, and does not depend for its efficacy on any nice inside fittings, the only part exposed to wear being the collar O on the fan shaft, and its bearing, which may be renewed at any time, without in any way disturbing the balance of the machine, these parts being on the outside.

These machines have been in use several years, giving perfect satisfaction, and it is now introduced to the gas fraternity as one of the few so-called new things, which is really meritorious.

This machine occupies a space of about three feet square, and is about five feet in height, giving a great economy in the matter of buildings for a gas company, as the work of condensing, scrubbing and exhausting is all concentrated and performed in a most effective manner by this one small machine.

Further information can be had from CHARLES NETTLETON, 117 Broadway, New York city, he having used one of these machines for the past three years.

The Reithmann Gas-Engine.

This engine consists essentially in a cylinder having two pistons, the space between which varies in the course of the stroke. The up-stroke is obtained by the explosion of a mixture of illuminating gas and atmospheric air, as in the Lenoir and Otto-Langen engines. During the up-stroke the back piston approaches the front one, compressing the air in the space between them. The down-stroke is effected by the detention of this air, combined with a lowering of the pressure produced in the hinder portion of the cylinder by the condensation of the gases liberated in in the explosion and the cooling of the illuminating gas, each condensation and cooling being effected by a current of cold water circulating in the casing of the cylinder. In the Otto-Langen engine there is only one piston, the cylinder being open at one of its extremities. According to a communication made by Prof. Linde to the Polytechnic Association at Munich, it appears, from a theoretical comparison of the two engines, and an examination of the diagrams, that the Reithmann engine furnishes per stroke a lower motive power than the Otto-Langen engine. The heat evolved during the compression of the air in the former engine is, besides, not entirely given back in mechanical work during the detention of the air, a part of this heat being transmitted, for no useful purpose, to the cold water in the cylinder casing The advantages of the Reithmann engine consist in the uniformity of its movements and in its well-understood arrangement. —*London Journal of Gas-Lighting.*

Chemical Repertory.

No. 134.—June 16, 1875.

EDITOR—HENRY WURTZ.

CHEMICAL EXCERPTS.

1435. MENHADEN OIL FISHERY.—The season began May 31 on Long Island Sound with much spirit. The fish are numerous and fat. Menhaden oil takes the place to a large extent of whale oil, and grows in favor. That and cotton seed oil have nearly completed the revolution in the oil trade which was begun by the discovery of petroleum in large quantities.

1436. GOOD GOVERNMENT WORK.—A Royal Commission has been appointed in Great Britain to make inquiry with regard to the causes of the spontaneous combustion of coal in ships, and the remedies which it may be possible to adopt for preventing and guarding against them.

1437. A NEW COAL ROAD.—On the first day of June the Easton and Amboy Railroad was to be thrown open for travel. It is an extension of the Lehigh Valley Railroad, running in almost an air-line from Easton, Pa., to Amboy, and seems destined to be the great coal road of New Jersey. It will begin its career without a dollar of debt, bonded or otherwise, to jeopardise its success, and with the record that it was built entirely with the money secured for its stock. Every line from this vicinity that taps the coal fields is an additional security to our manufacturers, and another pledge of a cheap and abundant coal supply in the future.

1438. CORROSION OF MARINE BOILERS.—At a meeting of the graduates' section of the Institution of Engineers and Shipbuilders in Scotland, held in Glasgow, the president (Mr. James Gilchrist) read a paper bearing the above title. In illustration of his subject, Mr. Gilchrist exhibited a number of drawings, and also specimens of stays, nuts and angle irons, which showed the extensive corrosion taking place in marine boilers. Chemical analyses of the incrustation, and also of the water used, were given; it being stated that the chemist attributed the cause of the corrosion to the presence of fatty acids produced by the distillation of the tallow and oil used in the machinery, and also, in some instances, to prevent priming —this fatty acid attacking the plates and eating them away in a most extraordinary and rapid manner. With a view to diminish the action of this acid he recommended that common chalk be placed in the boiler to form a basis, which, absorbing the acid, would therefore prevent its attacking the boiler plates.

1439. WOODEN PAVEMENTS.—It is reported from Washington that merchants and other business men owning property on Pennsylvania avenue, and intersecting streets, have petitioned the District Commissioners for an entirely new pavement from the Capitol to the Treasury Department. The petition represents that the pavement is now dangerous to life and limb. it is offensive to those living, doing business, or driving on it; it is a disgrace to the history of the avenue, known as it is throughout the country and abroad. This wood pavement was laid four years ago, under an act of Congress before the creation of the Board of Public Works. The Board laid in other portions of the city about sixty miles of such pavement, which is now everywhere in a state of decay.

1440. FIRES CAUSED BY SOLAR HEAT.—The Plymouth correspondent of the *Pall Mall Gazette* writes:

"Two incidents have just occurred which more than suggest that some 'mysterious' fires may have their origin in the action of the sun on glass. A few days ago the master of the Volunteer steam tug in Plymouth Sound found that a large hole had been burned in the centre of the covering of his berth, and that the fire had penetrated to the bed itself, which was smoking. It was then discovered that this resulted from the concentration of the sun's rays by the glass 'dead lights' in the side of the vessel. The grounds of a new mansion at Paignton are entered through gates richly gilt and ornamented. To protect them temporarily they were covered with canvass. On Sunday afternoon this covering was found to be on fire and was burned, one of the lamps above being broken by the heat. All ordinary theories of the causes had failed to account for this one, and it was discovered that the globular lamps of the gate concentrated the solar rays and directed them on the spot where the canvass had been and thus doubtless occasioned the fire."

1441. EXPERIMENTS WITH MINERAL OILS.—The Light-House Board, for some time past, have been making experiments with mineral oil for the purpose of testing its practical value for light-houses. The chairman of the Board, the Naval Secretary, and several members of the Light-House Commission have, during the past week, been at the Staten Island Light-House depot making experiments with various mineral oils. Other preliminary tests have been made at the Smithsonian Institute, but it was determined that final tests should be made at the Laboratory on Staten Island. Formerly mineral oils were used only at small light-houses, but lately the light-houses on the Ohio, Mississippi, and Missouri rivers have adopted this oil. The committee having the matter in hand are anxious to find oil, or a combination of oils, which will be effective and safe, with a view to its general adoption.

May 18, it was reported that the chairman, Nava- Secretary and several members of the Light-House Board, had gone to the general light-house depot at Staten Island as a committee to test the many specimens of mineral oils sent there in accordance with the advertisements of the Board, with a view of ascertaining which of the oils, can be adopted for certain uses in the light-house establishment.

1442. THE EAST RIVER BRIDGE.—The East River Bridge is now a public work, Governor Tilden having signed the bill providing that it shall be built jointly by New York and Brooklyn. Under this new enactment additional appropriations are authorized to an aggregate of $8,000,000, of which not more than $3,000,000 may be expended in any one year, and of which New York is required to contribute one-third. The amounts hitherto paid in by private stockholders are to be repaid with interest. The affairs of the enterprise are to be administered by a new board of trustees, sixteen in number, one half to be appointed by the Mayor, Comptroller and President of the Board of Aldermen of New York, and the other half by the same officers of Brooklyn, the Mayors and Comptrollers of the two cities being ex-officio members of the Board.

Some weeks since it was stated that the last stone on the Brooklyn tower of the bridge, was set. The tower is now 271½ feet above high tide, and contains 35,000 cubic yards of stone, weighing 70,000 tons. The saddles and work on that tower was then to be suspended for the present. The New York tower and the Brooklyn anchorage will probably be completed this season, and next fall or early next spring the cables will be laid.

The Pavement Bill Passed.—ALBANY, May 20.—The pavement bill, introduced by Mr. Daly in the Assembly and providing for the repavement of the streets of New York now paved with wood and concrete, was before a conference committee this day, made up of Senators Woodin, Fox and Ooe, and of Assemblymen Daly, Dessar, Kirk, Seward and Husted. The bill was amended by a substitute in the Senate, and by unanimous vote it was at last decided to accept the Senate bill, Messrs. Daly and Dessar dissenting. The bill permits the Board of Aldermen to order a street repaved on the recommendation of the Commissioner of Public Works. The character of the pavement is left wholly to the discretion of the latter officer. The bill as originally drawn made the pavement stone block, and required it to be let to the highest bidder, and it was to the rejection of this feature of the bill that Messrs. Daly and Dessar objected.

Third Semi-Annual Meeting of the American Gas-Light Association,

At Washington, D. C., May 12, 1875.

[Continued from page 205.]

4 O'Clock, P. M.

Mr. Denniston—Mr. President: I have been very much pleased with the article read by Mr. Walker. I am gratified to know that he is satisfied that morally and financially it is a success. There are some questions which may arise here as to some of the statements made by my friend Mr. Harbison, as to the amount of gas that can be made in six days. I do not, however, propose to discuss them. I merely wish to say that I do not think Mr. Walker wished to charge upon all those who do not dispense with Sabbath labor that they are misers (or some other term equivalent to that, which he used), for there are those who cannot get along except by working on the Sabbath. I merely wish to call the attention of the gen tleman to that point. I do not remember now the terms that he used, but he seemed to put them all in one class; that they were not the right kind of people; that they were misers? that it was simply for the money that was in it, or something worse than that. I do not think that is the case, for there are those who cannot help it—who are obliged to work on account of their scarcity of capital, and consequent scarcity of holder capacity.

Mr. Walker—I do not wish, Mr. President, to attribute any mean motives to any one, but I am still of the opinion that if a gas engineer can get along through the winter by Sunday labor, he can dispense with it in summer, even if his storage is not just what it ought to be. I know that when I told a gentleman in Hartford that it required more storage to do it we immediately got it. It is all a matter of opinion with people whether they do it or not. It is, however, I think, a matter of right that the men should have it. I think if a great many more should try it than do, they could do it very easily. As I stated before, my men were so anxious to do it, that they exerted themselves to keep up the supply of gas in every way possible, in order to get off on the Sabbath. I think still, if friend Denniston can run through the winter, he can manage to give the men the Sabbath in the summer.

Mr. Allen—Mr. President: I suppose it is only fair to presume that all the companies represented here desire to do the best they can for their men. I do not apprehend that anybody keep their men employed on Sunday merely for the sake of making them work, although some companies may be so situated that they may be able to tide over the Sabbath without so much labor as other companies, and I suppose that if all companies were in the same condition they would themselves cheerfully do it, but we have to bear in mind that when a ship is crossing the ocean you cannot lie at the dock and wait over Sunday. A certain amount of labor has to be performed, or the ship may be lost.

There is no company I apprehend—and I may speak perhaps in that broad line of thought—no company which can carry on their business without Sunday work, because it is absolutely necessary that their works should be continued. You might as well say of a blast furnace that it shall not do any work on Sunday. They are obliged to keep up their fires. It is a business that cannot stop work any more than crossing the ocean.

But another principle comes in. The question is: Whether the same results may be obtained with less labor? I believe that wherever the necessary labor can be reduced there it should be. Now, if in running a ship a certain number of men were required to carry a certain amount of freight; if a better ship carrying more freight could be run with one-third of the men, you would observe the Sabbath then to the extent of your ability by adopting that ship, instead of running an old one, which requires three times the number of men.

Therefore I think it is narrowed down simply to the best mode of furnishing gas over the Sabbath, with the least amount of labor that is necessary to produce that result. The old form of making gas from coal has been so long in use, that it is wholly unnecessary to comment on it. A certain amount of labor is absolutely necessary for the purpose of continuing the work and producing the result. Talking about having storage enough to last over Sunday, that would be one of the heaviest taxes that companies could very well impose upon themselves.

I shall not, standing in the position I do, say much now except this: I believe that I am right in the position I have taken. I have under consideration a process which I have been much interested in, and followed up with an earnest desire and a sole desire, of bringing this question to a successful result. That will necessarily almost bring in this question that is now before the association. If I could satisfy a gas company, and I have great confidence that hereafter I will be able to do so, that with one-third of the labor they can produce a better gas; and that on Saturday night they will have nothing to do but just—as the boy said—let her run; I think that will touch very closely upon this question. They do not stop making gas, but it runs itself, with t e simple labor of keeping up the fires; that labor must be performed. The benches must be kept heated, and it would be impossible under any form of making gas that I know of, to do otherwise than to keep up the fires. But that would be a great gain towards saving labor on Sunday. The expense I shall not now discuss.

In answer to the remarks of Mr. Walker I felt that it was due to the great body of the people engaged in the manufacture of gas, to suppose that they to their utmost extent desire to lighten the labor of their men on the Sabbath day, just so far as they were able to do, and produce the necessary result; that is to furnish their customers with the required gas. I do not believe that unless they go to a very large expense in providing an unusual quantity of storage room, that they can do very much different from what they have been in the habit of doing for years past. But if they are enabled by another process to reduce their labor to a third, I think when they come to that point they will get to the minimum of labor that any company is under the necessity of using on the Sabbath day. I shall simply refer now to the fact that I speak now of making gas out of water; a true scientific mode of making gas.

I will not speak of the expense now, Mr. Chairman, because probably it might not be decided in order. When the time arrives I do not think there will be any difficulty in any one who desires it, keeping the Sabbath, and I advocate and profess to believe that it is the duty of every one to keep that day holy. But God has so ordered the business of this world that there is work that cannot be avoided on that day.

Mr. Forstall—Mr. Chairman: After an experience of years in the city of New Orleans, I can confirm every statement that Mr. Walker has made as to the advantages to the men and to the company. I tried last year, after the twelve months was up, to find out how much more the gas had cost us dispensing with Sunday labor than it had the previous year, and I think I made it to be about one quarter of a cent a thousand feet. The gas was just as good; the men were all in better condition and better pleased, and our yield on Saturday night was enough greater than it was on other nights; almost to make up for the deficiency of supply. I think those are the main points, so far as the gas companies are concerned.

There can be no doubt that the men are benefitted, and if a gas company can benefit their men without suffering themselves to a material extent, I think it is their duty to do so.

Mr. Harbison—Mr. President: I wish to say a single word more in regard to the suggestion of my friend from Pittsburgh, that every company can afford to furnish the increase of storage capacity, by saying that the yield gained from observance of the Sabbath in results obtained, will very soon pay for the increase of storage necessary. And in reply to what Mr. Allen has said in regard to reducing labor to a minimum by a certain mode of making gas, instead of reducing it to 33 per cent as he suggests, it has been reduced in our works to 9 per cent, as compared with other days.

Two years ago last winter, with the working force including day and night men, 44 men ran 22 benches, and our largest consumption was 425,000 cubic feet in the 24 hours, and this last winter, with a consumption of 475,000 feet, or an increase of 50,000 cubic feet over two years ago: the work has been done six days in the week with the largest number of men at any one time employed being 30, as against 44 heretofore. The largest number of benches lighted in our works during the past year has been fifteen benches of six retorts 14 by 22, 9 feet long, and the fifteenth bench was only lighted for three weeks during the holidays.

Mr. Price—Do you attribute the ability to reduce your labor so largely to the fact that you keep the Sabbath?

Mr. Harbison—No; but it in part results from that.

Mr. Price—That question depends upon other causes.

Mr. Harbeson—Yes, but I said that in part that was the case.

Mr. Neal—Mr. President: I think the attention given to this subject is very honorable to those companies who have instituted the practice of securing a better observance of the Sabbath, and which is the case with most of the companies. The company I represent I believe cannot dispense wiah Sunday labor just yet.

The largest consumption of gas furnished by our company is on Saturday or Monday nights. I cannot see how with our present storage we can dispense with Sunday labor, although nobody would be more pleased to do so. I believe in keeping the Sabbath day holy. I am myself a church-goer twice and sometimes three times a day, and I also attend our Sunday school, and I feel sorry that the men are at work while I am at church. Still they have an opportunity every fortnight on Sunday to attend Divine service, and they do so. Mr. President: In conclusion I would move that a vote of thanks be tendered to Mr. Walker for his paper.

The following resolution was then unanimously adopted:

"*Resolved*, That we have listened with pleasure to the report of Mr. Walker, upon the question of dispensing with Sunday labor in gas works, and to the remarks made by him in relation thereto, and we recommend to the managers of gas works to test the feasibility of Mr. Walker's views."

A paper was then read

On the Proper Preparation of Lime for use in the Purification of Coal-Gas.

By Theobald Forstall, Esq.,

General Superintendent New Orleans Gas-Light Co.

How wet should lime be when in the best condition for use in dry lime purifiers? is the question I propose to consider in this paper.

The chemistry of lime purification has been almost exhaustively investigated of late years, under the spur of the restrictions imposed by Parliament, upon the English gas companies, in respect of the "sulphur" impurity.

The reports of the London Gas Referees, and the subsequent discussions between Messrs. Evans, Patterson, Anderson, Mann and other eminent engineers, have thrown a clear light upon the proper method of operating a series of lime purifiers, so as to obtain the most thorough elimination of all the impurities removable by lime; but with regard to the preparatory manipulation of the hydrate—a radial point—upon which depends, primarily, the success of any system of operating the purifiers themselves, nothing has been written during this long controversy. Indeed, throughout the whole literature of gas manufacture, this important question has been strangely neglected.

From the invention of dry lime purification, in 1817, down to, and excepting only, the two latest treatises on gas, successive writers have contented themselves with a few lines of vague directions, alter-

ed, but not improved, from the original specification of Phillips. Schilling is the first to insist upon the importance of proper preparation, and points out the error of the mode commonly employed; but his directions are insufficient to secure uniformity of results in daily practice, and his method too clumsy and tedious for American habits.

Going back to the origin of the change from wet to dry lime purification, the inventor, Reuben Phillips, in his specification dated July 19, 1817, describes the *modus operandi* in these singularly precise and intelligible words:

"I take any quantity of well burnt lime and pour water on it till it falls to powder. I then mix it with a further quantity of water, in order to bring it into such a state that the particles of lime may adhere slightly to each other; but not to such a degree as to prevent the free passage of the air between them."

Now in what manner have the text books transmitted to us this testimony?

Clegg, in his first edition, (1841, page 114) writes: "In preparing the lime for the purifiers it ought to be beaten, well sifted, and water added, *until by compression in the hand the lime will just adhere.* If any lumps remain, their outside only will be acted upon.' The words which I have italicized were afterwards modified; and in the last edition of the work (1868, page 198) are made to read: "Until by compression in the hand it will retain the form thus given it." A distinction without a difference to an ordinary reader; and yet with a most perplexing difference to the enquiring mind; for the first formula, although not expressing the best condition of the lime, is clear and easily carried out. But the second really expresses nothing definite, for when sufficient moisture has been added to the slaked lime to make it retain the form assumed upon compression, more and more water may be added, and the lime will still retain the form given it, long before it becomes pasty; so that a hydrate weighing 60 lbs. to the bushel measure would conform with this condition just as well after an addition of 30 lbs. of water, although the purifying power would be entirely changed. Besides, Phillips says nothing about adhering *under compression in the hand.* The lime is to be wetted until its particles will adhere to each other spontaneously; and the limit of moisture is merely dependent upon the free penetrability of the mass by gas.

Peckstone disposes of the question in two lines (1841, p. 245.) He says:

"Fresh slaked lime so far wetted as, on trial, not to adhere to or discolor the hand." Here, again, the range of moisture which will comply with his conditions, is too extensive for uniformly good results.

D'Hurcourt (1863, p. 289) merely mentions the fact that "for dry lime purification the lime is slaked and spread over the grids of a purifier to a thickness of about six centimetres."

Schilling (1868, page 75) writes: "The degree of moisture is of the greatest importance. In many works the rule is to slake the lime in such a manner that it will neither fall into powder, nor adhere to the fingers when compressed. * * * * *In this condition, however, the lime is too dry;* it causes much pressure."

"It is hardly possible," he adds, "to indicate precisely the quantity of water required for a given weight of lime, but there will be little danger of error in operating as follows: Spread the quicklime over a stone floor, and surround it with a slight dyke of slaked lime, to prevent the water from running off; then slake it with water thrown upon the mass with pails, but not with a hose. It is then to be well mixed and turned over, until the whole forms a thick and homogeneous mush. It must then be thrown in a heap and left undisturbed until the next day * * * when it must be again worked over, and the lumps broken. In this manner a dense mass is obtained, which does not run together, and of which all the small lumps are well detached from one another. The layers should be from 5 to 8 centimetres in thickness, and the fragments of lime of the size of filberts." I have here translated, with slight omissions, the whole passage relating to this subject, first; because Schilling's is the only book which contains detailed practical directions; and, secondly, because his work is not yet accessible to English readers, although an excellent French translation has been published in Paris. We come now in chronological order to the "Treatise" which is being published in weekly parts in the *London Journal of Gas-Lighting*, and which promises to supply the need long felt in our profession, of a work embodying the results of the best thought of the past ten years, upon all subjects relating to the business of gas-lighting. The author (*J. G. L.*, v l. xxxiv, p. 633) shows a clear appreciation of the prevailing errors in the manipulation of lime, inculcated by Clegg and Peckstone. "Notwithstanding the clearness of description in Phillips's specification," he writes, "there are few processes in gas manufacture which have been so imperfectly applied as dry lime purification. The term is certainly a misnomer, and no doubt has frequently led to the improper application of this method of purifying; for the writer has often witnessed it employed literally as dry lime, and sometimes carefully sifted prior to being placed in the purifiers. Lime, when thus employed, is almost useless * * * but when well moistened, and in such a state that when pressed in the hand, it possesses a doughy consistency, it is used to the best advantage."

These extracts contain all the information upon this subject to be found in the text books from 1817 to 1875. They are contradictory, and dogmatic; leaving just where Phillips left it, the question which I have proposed for discussion here to-day: "How wet should lime be when charged into the purifiers to give the best results?"

That it is an important question is manifest from published reports of gas-works, both in England and America, in which the duty of a bushel of lime is seen to vary from 500 cubic feet of gas purified, through all the intermediate quantities, up to 20,000 cubic feet. And while it is true that coals vary in sulphur and limes in strength, it is also true that much of this discrepancy of duty is due to the more or less efficient condition of the lime as placed into the purifiers of these various works; and, other circumstances being equal, it is safe to assert that this difference in moisture is the principal cause of the difference in duty.

It seems to be forgotten that the change from wet to the so-called dry-lime purification, was not induced by any want of efficiency in the liquid preparation, but by the desire to get rid of the terrible nuisance created whenever it became necessary to replace it with fresh material. Keeping in view, therefore, the alteration in the mode of bringing the gas in contact with the lime made necessary by the change from the liquid to the solid form of the hydrate, the nearer we approach the condition of wet lime in our purifiers, without losing the advantages of free penetrability and comfortable handling, the better shall we carry out the intention of Phillips, and appreciate the value of his invention. Clegg's first formula, however, ignoring this truth, undoubtedly represents the common practice in gas works at this day. Lime is slaked, and water added, until by compression the powder will only *just adhere.* In this state the lime will not purify one-half of the quantity of gas per bushel that it otherwise would, besides considerably increasing the resistance presented to the flow through the purifiers; and my own experience further shows that the more water the lime can be made to hold without running into paste, the loss will be the resistance and the greater the duty performed. As the author of the Treatise last quoted aptly remarks, "dry lime is a misnomer"; "granulated" lime would come nearer the true description.

That this conclusion has not been reached without sufficient reason, will be shown by the facts, which I shall now state for the benefit of any member of this Association who may be wrestling with tradition in his purifiers, unconscious of the simple remedy that exists for his troubles.

During the winter of 1870–71, an average of 900,000 cubic feet of gas was daily forced through three purifiers, 14 by 19 feet square, with 10-inch connecting pipes, at the New Orleans Gas Works. This was at the rate of 37,500 cubic feet per hour. The resistance was such that, although in previous years the seals had been deepened from 14 to 18 inches, yet twice a day, at the hours for meals, when the charges followed closely upon one another in the retort house, the gauge at the inlet of the purifiers marked a pressure of 18 inches. The outlet pressure was a mean of 5 inches, showing the resistance due to the purifiers alone to be 13 inches. It was quite a matter of course that the water should be blown out of the cups at these times, and a man was always on guard, water hose in hand, to replenish the seals while the blowing lasted. At other times the normal inlet pressure was 16 inches. Not more than four inches of lime, in two thin layers of two inches, could be worked in each purifier, making a total thickness of 12 inches in the three boxes. Two changes daily were compulsory; and sometimes the spare vessel was hardly charged before another change became urgent. Constant vigilance was absolutely necessary for safety; and the men lived in an atmosphere completely saturated with the vapors of ammonia and sulphuretted hydrogen. Such was the daily situation for three months.

When the spring came, giving us a season of relief, I began to consider how we were to get through the winter with its increased production. Larger purifiers were out of the question for that year, and a cure must be sought elsewhere. No suspicion had ever occurred to me that the lime was at fault, for we had strictly followed the instructions of Clegg, and our hydrate just "adhered upon compression, retaining the form assumed." But just then I received Schilling's book from Europe, and read the passage above translated. This pointed directly to the source of trouble, and placed the remedy in our own hands. We were then purifying between 8,000 and 9,000 cubic feet per bushel of unslaked lime, and probably would have remained satisfied with this duty, had we been enabled to reduce the pressure.

Following Schilling's directions as closely as their vagueness would permit, the first experiments were only partially successful. There was no uniformity in the consistence of the hydrate. The slaked mass would break up into irregular lumps of all sizes, from that of a pebble to that of a paving-stone; and at others assume the adhesiveness of soft putty, clinging tenaciously to shovels and boots and barrows, and almost impervious to gas.

After several weeks of experiment, generally unsatisfactory, but with now and then a stroke of good luck which showed clearly the lurking possibilities of the new departure, we struck upon a simple and effective means of gauging the proper degree of moisture and securing its uniformity throughout the whole charge of lime operated upon. This was to pass the slaked lime through a wire screen with an open mesh of one square inch area, placed at an angle of 70° with the floor. This screening reduced the lumps into granular pellets of irregular form and size, the largest of which did not exceed the bulk of a small hickory nut. The pr per degree of moisture was found to be that beyond which any excess would cause the "dough" to adhere to the screen instead of breaking through. Slight variations of moisture, in different portions of the charge, were corrected by the thorough mingling of the whole in the screening. The pellets did not adhere to one another spontaneously, but could be shoveled into barrows and reshovel d into the purifiers without losing their independence; but the slightest compression and working in the hand, would resolve them immediately into adhesive putty.

This was the key to the desired solution, and not a charge was afterwards missed. The advantage of the screen over Schilling's method of breaking the lumps by hand, lies in the saving of labor and greater uniformity of results The benefits of wet lime were immediately made manifest in the purifiers. The pressure fell several inches, and charges became less

frequently necessary. As the men became accustomed to the work, the results improved from month to month, and by the time that winter returned we were no longor in any fear of it. The maximum daily production of 1,100,000 cubic feet flowed easily through 27 inches of this wet, granular lime, under an inlet pressure of 13 inches, in the same purifiers which had refused passage the previous winter to 1,000,000 cubic feet through 12 inches of dry lime, except under a pressure of 18 inches; while but one daily change was required instead of two.

In the following spring the thickness of lime was increased to 36 inches in layers of four inches; and finally, in 1873, to 54 inches, in layers of six inches; and this thickness was maintained with but slight increase of pressure throughout the winter of 1873–74. Not until December 6, 1874 was the gas turned into larger purifiers; and up to that day every bushel of lime used in the old boxes during the eleven months of that year, had purified 20,000 cubic feet of gas; while the charges were still further diminished in frequency to once a week in summer and twice a week in winter.

To exhibit at a glance the increase of duty per bushel, and the reduction of pressure, I have compiled from the station reports, the following table:

Year.	Average daily production for December. Cu. ft.	No. of layers of lime worked through.	Total thickness of lime. Inches.	Maximum pressure at inlet of purifiers.	Mean pressure at outlet of purifiers.	Cu. ft. of gas purified per bushel of lime in December.	Cu. ft. of gas purified per bush. of lime for the whole year.	Condition of Lime.
1870	969,000	6	12	18	5	7,752	9053	Dry
1871	1,010,000	9	27	13	5	11,222	10000	dry during ½ the year.
1872	1,067,000	9	36	15	5	11,854	11807	Wet
1873	993,800	9	54	17	5	22,084	17291	Wet

I have placed these figures before you not to lay stress upon the absolute duty performed by the lime during 1874, but to mark the great difference between December 1870 and December 1873, and the gain in these three years of nearly 200 per cent in the purifying capacity of the lime obtained almost entirely by the simple addition of water under careful manipulations. This economy of material was accompanied by a corresponding saving in labor and wear and tear of purifier grids. Nor was the benefit confined to quantity, but extended to the quality of purification as well. No trace of carbonic acid passed the second purifier, and the "sulphur" impurity was brought down to a range of from 5 to 11 grains per 100 cubic feet, with a mean of 9. grains.

As I said before, there can be no absolute standard of duty for a bushel of lime, except under similar conditions of coal and lime supply; and even then, the difference in preliminary treatment of the gas in the condensing and scrubbing apparatus will cause a discrepancy of results in different works. But it will be easy for any manager to ascertain whether he is getting the best duty possible under his conditions of production, by experimenting a little in the direction indicated by the above facts. That there is ample room for improvement in some places, one single example will demonstrate; and as the figures are public property the illustration involves no violation of confidence. In the Fortieth Annual Report of the trustees of one of the largest gas undertakings in the Unitad States, it is officially stated that 345,550 bushels of lime were used in their works during the year 1874 to purify 1,776,268,000 cubic feet of gas, or one bushel to every 5.112 cubic feet. As the coal and lime used in their works are of the same quality as those used in New Orleans, it is fair to assume that similar manipulation would produce equal results in both cases. Taking the proper duty per bushel to be 20,000 cubic feet, the waste of lime in one year in this one city, amounts to 257,000 bushels, or at the price of 20 cents per bushel, to $51,400.00. Add to this the cost of labor uselessly expended in slacking, charging and discharging this excess of material, and the aggregate represents a very respectable sum.

I submit, therefore, as the result of actual experience:

1. That the granulated hydrate, containing as much water as it can be made to retain without becoming adhesive under careful handling, will purify a much greater quantity of gas per bushel than when in the dry and almost dusty state in which it is generally employed.

2. That in the former condition it offers less resistance to the free passage of the gas through the purifiers; and

3. That numerous thin layers of lime can, therefore, be advantageously consolidated into a lesser number, of greater thickness, with economy of labor and wear and tear.

The statement made by Clegg that the lumps are acted upon only on the outside, does not apply to the granulated preparation. This, on the contrary, is so penetrable to gas that lumps as large as walnuts are thoroughly saturated, even when lying loosely upon the surface of the layers. I have here a few specimens picked up at random in the last opened purifier which will speak for themselves.

The only objections which reached me against the change in the mode of preparation did but add further proof of its advantages, and are worth mentioning.

The first complaint came from the men in the retort house. They had from time immemorial used the spent lime for luting the retort doors. It was soft and made good mortar; but when the wet lime became spent it left the purifiers in the shape of solid slabs, almost as hard as stone, and to soften it in water was impossible There was wailing among the luters, and we were compelled to purchase loam at the price of 20 cents per barrel, to replace the lime which had cost 60 cents.

The second objection came from the contractor who purchased all our residuals at a fixed price per ton of coal carbonized. He had been in the habit of getting good prices for the foul lime for building purposes, and found his income from this source suddenly cut off. As the contract specified that he was to receive spent lime, and we were only the better carrying out our obligation in delivering it as well spent as possible, he sadly resigned himself to the inevitable.

The better to illustrate the difference between the two conditions of the hydrate, I have prepared two samples for the inspection of the association. The first complies with Clegg's formula and weighs sixty pounds to the bushel measured. The second was taken from a charge just ready for the purifiers, and weighs 92 pounds to the bushel. There are also samples of the spent lime taken from each layer of the last opened purifier, after being in action 38 days and purifying 24,000 cubic feet per bushel.

In conclusion, I trust that this subject will receive the fullest discussion, and that any facts which confliet with the experience above related will be brought forward at this meeting.

[To be continued.]

Water-Supply Items.

YONKERS.—Col. J. W. Adams, Civil Engineer of the Brooklyn Water Works, has examined the plans of the engineers employed by the Board of Water Commissioners of Yonkers for obtaining a supply of pure water for the latter city, has approved of them, and assures the citizens that they may expect sparkling water from the Grassy Sprain. It is estimated that the works necessary for the delivery of 1,500,000 gallons of water into the city daily, including pump-well, engines, boilers, etc., will cost $210,143. Messrs. Edward F. Baird, Orrin A. Bells and Thos. F. Morris, commissioners appointed by the Court to award damages for land taken, and deprivation of water in the matter of constructing the reservoirs, have awarded $475 per acre for land and the deprivation of water on the Grassy Sprain, making an aggregate of $82,323: and on the Sprain $26,551 for the deprivation of water, the total award amounting to $88,875.

NEW JERSEY.—The Newark Aqueduct Board has disposed of $150,000 of its bonds at 104 1.16.

Commissioner Van Reipen, in the meeting of the Jersey City Board of Finance May 20, openly charged that the former Board of Works had been guilty of the grossest maladministration and had defrauded the city of hundreds of thousands of dollars. Commissioner Fry, who was a member of the board alluded to, denied that there had been any frauds perpetrated, when Mr. Van Reipen charged that most barefaced thieving had been done in connection with the reservoir, and that frauds committed directly or indirectly have been known to him.

At a meeting of the Jersey City Board of Works, May 11, J. B. Cleveland, contractor to build the new reservoir sent in a communication, the substance of which is, that Jeremiah wants to back out of his contract, and giving reasons why he has the right to do it. Referred to the "Committee on Pumpings and Reservoirs."

THE CROTON—IMPORTANT BILL PASSED.—ALBANY, N. Y., May 22—The three Booth bills, in relation to which the conference committee has at last failed to agree, were reported to the two chambers this morning and a new conference committee appointed, consisting of Senators Booth, Tobey and Parmenter, and Assemblymen Daly, T. J. Campbell, McGowan, Hess and Worth. These three bills related to the Croton Water Works, the reference of city cases and the opening and improving of public streets and avenues. The new conference committee retired, and very soon reported the most important of these bills, that in relation to the Croton water. This bill, as it originally came from Comptroller Green's office and introduced in the Senate by Senator Booth, was one section long and simply declared that all the powers enjoyed by the Commissioner of Public Works under the general act in regard to the introduction of pure and wholesome water in New York, and acts amendatory thereto should be enjoyed only under the written consent of the Mayor and Comptroller, The Assembly amended this by substituting "Mayor and Board of Aldermen," and added to the bill an Assembly enactment providing for the introduction of Croton water into the new wards and some islands at an expense of $1,500,000, to be met by an issue of bonds. The only change made by the conference committee was to make it "Mayor and three-fourths of the Board of Aldermen," and permits them to order the necessary appropriations, the Senate practically receding from its position. The bill as amended was passed by both chambers, and was the last acted on in the Assembly. No attempt was made to report the other bills. In the Senate the vote stood 20 ayes to 4 nays. Mr. Booth dissented from the report of the conference committee to the last.—*World.*

CHICAGO.—In this city we learn that there are now 392 miles of water pipe of different sizes in use, about 36 miles of which were laid during the past year. There were 300 double and single hydrants built. This number, added to the number last year, makes the total number of 2,439 in use. There were 19 fire cisterns constructed in various parts of the city. Owing to the continuous cold weather, 94 of the fire hydrants were frozen solid, but, through persistent applications of the proper remedies, not more than one half that number were out of service. In some in-

stances the frost had penetrated the earth to the depth of six feet, and the water in the mains was frozen. No serious results, however, were incurred. As in a previous report, the Marshall again urges the necessity of doing away with all pipes less than eight inches in size for fire purposes, and that eight inch pipe be used only in short streets.

A Pennsylvania paper furnishes us the following clippings:

"They are beginning to be troubled in Philadelphia now about a new $900,000 demand of their water ring."

"Karns City (oil region) has been 'resolving' about water works."

Report of a Special Committee Appointed by the Secretary of the Interior to test the Relative Merits of Certain Gas-Governors.

INTERIOR DEPARTMENT,
WASHINGTON, D. C., May 13, 1875.

Sir: The undersigned, under instructions from you dated April 3, 1875, met in the office of the superintendent April 28, 1875, and proceeded, as requested, to test the relative merits of the "Leffingwell," "Adams & Stickney," and "Russell" gas-governors. All members of the committee present. The following was agreed upon as to the mode of procedure:

First. The consumption of gas in twenty-four (24) hours with governors, with six burners.

Second. The consumption of gas in twenty-four (24) hours with governors, with six burners, but in this test the burners were changed from one governor to another.

Third. The consumption of gas in twenty-four (24) hours with governors, with six burners, burners to remain as in second test, with meters changed from one governor to another.

Fourth. The consumption of gas in twenty-four (24) hours with six burners; in this test the burners and meters as arranged in first test.

Fifth. The consumption of gas in twenty-four (24) hours without governors, with six burners.

Sixth. The consumption of gas in twenty-four (24) hours without governors, with six burners, but in this test the burners were changed from one meter to another.

Seventh. The consumption of gas in twenty-four (24) hours without governors, with six burners, burners to remain as in sixth test, with meters changed from one fixture to another.

Eighth. The consumption of gas in twenty-four (24) hours without governors, with six burners; in this test the burners and meters as arranged in fifth test.

Result of first test with governors.

The consumption of gas:

On the Leffingwell governor	775
On the Adams & Stickney governor	775
On the Russell governor	750

Initial pressure, nine-tenths; pressure after the gas passing governors, five-tenths.

The light obtained in this test very fine, and equal on all three governors.

Result of second test with governors.

The consumption of gas;

On the Leffingwell governor	815
On the Adams & Stickney governor	735
On the Russell governor	820

Initial pressure, ten-tenths.

Pressure after passing governors;

Leffingwell	six and a half tenths.
Adams & Stickney	four and a half tenths.
Russell	five tenths.

The light obtained in this test was satisfactory, and equal on all three governors.

Result of third test with governors.

Consumption of gas:

On the Leffingwell governor	810
On the Adams & Stickney governor	790
On the Russell governor	725

Initial pressure, ten-tenths.

Pressure after gas passing governors;

Leffingwell	six and a half tenths.
Adams & Stickney	four and a half tenths.
Russell	five tenths.

The light obtained in this test was very good on the Leffingwell and Adams & Stickney governors, but was not so good on the Russell governor.

Result of fourth test with governor.

Consumption of gas;

On the Leffingwell governor	830
On the Adams & Stickney governor	800
On the Russell governor	940

Initial pressure, eight-tenths.

Pressure after passing governors;

Adams & Stickney	four and a half tenths.
Leffingwell	five and a half tenths.
Russell	five tenths.

The light on the Leffingwell and Adams & Stickney governors was very fine, but the light on Russell governor not so good.

Recapitulation of the four tests with governors, as heretofore described.

Gross consumption of gas by the Leffingwell governor in the four tests made with six burners, meter No. 947	3,230
Gross consumption of gas by the Adams & Stickney governor in the four tests made with six burners, meter No. 1200	3,100
Gross consumption of gas by the Russell governor in the four tests made with six burners, No. 1140	3,235

The Leffingwell governor consumed 130 cubic feet of gas more than the Stickney governor, and the Russell 135 cubic feet more than the Stickney. The Russell consumed 5 cubic feet more gas than the Leffingwell.

The results of the fifth, sixth, seventh, and eighth tests with meters and without governors are as follows;

Meter No. 947, which was connected to Leffingwell governor in the four tests with governor, consumed in the four 24 hours' tests made without governor	3,575
Meter No. 1200, which was connected to Adams & Stickney governor in the four tests with governors, consumed in the four 24-hours' tests made without governors	3,545
Meter No. 1140, which was connected to Russell governor in the four tests made with governer, consumed in the four 24 hours' tests made without governor	3.480

The initial pressure of the gas observed in the four tests without governors was from eight-tenths to twelve-tenths.

Recapitulation of the results obtained in the eight tests made, four tests with governors and four without governors.

Gross consumption of meter No. 947, which was connected to Leffingwell governor in the four tests made without governor: this meter consumed	3,575
Gross consumption of meter No. 947, with governor connected, in four tests made with governors	3,230
Saving by use of governor over meter without governor, which is equal to about 9.7 p. ct...	345
Gross consumption of meter No. 1200, which was connected to Adams & Stickney governor in the four tests made without governor; this meter consumed	3,545
Gross consumption of meter No. 1200, with governor connected, in four tests made with governor	3,100
Saving by use of governor over meter without governor, which is equal to about 12.6 p. ct.	445
Gross consumption of meter No. 1140, which was connected to Russell governor, in the four tests made without governor; this meter consumed	3,480
Gross consumption of meter No. 1140, with governor connected, in four tests made with governor	3,235
Saving by use of governor over meter without governor, which is equal to about 7 p. ct.	245

Comparative statement showing the per cent. of saving of one governor over another.

Adams & Stickney over Leffingwell	2.9 per cent.
Adams & Stickney over Russell	5.6 per cent.
Leffingwell over Russell	2.7 per cent.

Judging from the results, as stated in this redort, the committee are of the opinion that the Leffingwell and Adams & Stickney gas-governors furnished in every particular a satisfactory light, equal in every respect to the light obtained without governors, and possessing at the same time the advantage of preserving a uniformity and steadiness of flame which is so much desired, but, unfortunately, cannot be obtained on account of irregularities in the pressure of the gas at different periods of the evening. A properly constructed gas governor, therefore, should be used by every consumer of gas who is annoyed during the hours of using the gas by excessive and irregular pressure.

The term governor, or regulator, is applied in this case to a small, self-acting instrument, generally attached to the outlet of the gas meter, at the entrance to the premises, and contains a suspended plug or cone, which opens or closes the orifice through which the gas passes, in direct accordance with the decrease or increase of the pressure, in the company's pipes. By this means the pressure in the consumer's premises may always be maintained at one uniformity so long as there is a sufficiency of supply.

Regulators, or governors, as they are commonly called, are of various constructions, but all embrace the principle just mentioned; some are made so as to require oil or water for their action. The first possesses an inconvenience—that after a length of time the oil congeals. The second, which is of the same construction as the Russell governor, is very effective, but requires to be placed in a situation of moderate temperature to prevent the water freezing or evaporating. Others, called dry governors, like the Leffingwell and Adams & Stickney, are made with a flexible partition of very thin, pliable leather, which carries the suspended cone and adjusts the supply.

In conclusion, we most respectfully recommend the dry governor, for this instrument, after being once adjusted, requires no further care or attention from the consumer of gas, which is a great advantage it possesses over a wet governor, the latter requiring that attention should be given it, so as to preserve a proper seal of water. Aside from this needed attention, a wet governor compares favorably with the dry governor for uniformity of light.

Very respectfully, your obedient servants,

B. S. HEDRICK,
S. CALVERT FORD,
THOMAS D. BOND,
W. H. BAILEY,
R. G. DYRENFORTH,
Committee.

Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—ED.

Farmer's Improved Dip-Pipe.

May 21, 1875.

Mr. Editor: The comments made by Mr. Farmer in support of his claim upon the "Improved Dip-Pipe," illustrated in your issue of March 16, the validity of which claim I took the liberty of questioning in my communication of April 7th, for the substantial reasons therein given, are neither satisfactory nor convincing. He first says there is a "great difference" between the dip referred to and his; and then, in explanation of this difference states, that wherein Chandler's dip pipe has a stuffing-box and rod over the center of the pipe, and his in place of a stuffing-box, has tubes sealed at the lower end, consequently his combination is not like Chandler's. If this is all the difference Mr. Farmer can show between his dip pipe and Chandler's—and it is all he *does* show in his "comments,"—surely he bases his clai upon very slight grounds. He says, in describing it; "The principal novelty of this invention is the arrangement for raising and lowering the dip-pipe," thus clearly indicating that he realized (and it must be self-evident to all) that the "*movable dip-pipe*" and *not* the the secondary matter of sealed tubes in place of stuffing-boxes was the leading feature of the invention. Now, this invention has been patented and in practical use for some years; a fact I should think which would somewhat impair its novelty, as well as jeopardize the claim which Mr. Farmer now makes upon it.

By comparing the respective illustrations of the two arrangements, it will be found that the description Mr. Farmer gives of his movable dip-pipe will, with equal accuracy, explain Mr. Chandler's.

Is then, the substitution of those tubes instead of stuffing-boxes, sufficient to justify him in possessing himself of the vital portion of another patent, and the results of another man's labors?

Mr Farmer's objections to the use of ground surfaces, whereby a gas-tight joint must be formed, under circumstances somewhat similar to Mr. Trumbore's plan, are reasonable, and I have no doubt will be generally concurred in. They also apply with equal force to his own device illustrated in the GAS LIGHT JOURNAL of February 16th, where "the principal novelty of the invention consists in placing an ordinary rotary bye-pass valve on the top of the dip and bye-pass pipe."

Yours, etc.,
OUT WEST.

Testing the Illuminating Power of Coal Gas.

[Correspondence "London Journal of Gas-Lighting."]

Sir: I trust you will pardon my troubling you with this communication, but as there is some probability of the vexed question of "test burners" once more being made the subject of parliamentary inquiry, as a matter of course the attention of most of those engaged in photometric experiments will be called to the matter. I would, therefore, venture to suggest whether this may not be an opportunity when the whole question of gas photometry might undergo revision. I believe I am stating the opinion of many of my professional friends, in saying that the present mode of ascertaining the illuminating power of coal gas is anything but satisfactory. All who are at all acquainted with optical experiments must be fully aware how unreliable such experiments are, if merely dependent on the capacity of the eye to register or determine any process where lights of varying intensities are being operated with, and how many errors may creep in in all observations made under circumstances so unstable as the consumption of the material of a candle. I have had personal experience which confirms this statement, for nearly eight years, while in charge of a gas work abroad. I was compelled, under the police regulations, to make four sets of experiments every 24 hours; oftentimes I have found candles that would vary as much as 10 per cent. in their rate of consumption, and were equally irregular in illuminating power; it would, therefore, have been obviously unfair to take such tests as anything but mere approximations of the value of the gas I was supplying. Not only is the standard candle an unreliable basis, but oftentimes a still greater source of error is the mode of manipulating. The color of the image on each side of the paper disc will vary considerably, and the effect of these variations on the eye of the operator often leads him to very false conclusions. In fact, the objections that might be urged against the present system are more numerous than at first sight appear possible; but if the subject is investigated impartially, they will all be found capable of being substantiated.

If what I have said be true, then will come the questions—How can these defects be remedied? or, What can be substituted for the present method of testing? To such questions I would answer—that the only absolutely reliable tests are a series of carefully made quantitative analyses, but these would be objected to as being too tedious and too expensive; then the next most reliable test would be the comparison of the gas flame with a lamp burning a fluid of known chemical composition (such as was proposed some years ago by Mr. W. Crookes, the eminent experimentalist), the actual value of these flames might then be determined by the aid of a polarizing apparatus. I know many experiments have been made, and the average variation in the values of the standard flames have not exceeded one per cent, when proved by the polarizing process.

But I am sanguine enough to believe that sooner or later the beautiful arrangement of the spectroscope will be adapted to the process of analyzing gas, and that by its aid we shall be enabled to ascertain the value of any illuminating agent by dealing with the structure and constituents of the various flames directly, and not, as is the case now, be under the necessity of comparing them with some secondary imperfect standard.

Every suggested improvement, I think, is worth careful consideration, so as, if possible, to put an end to the present anomalous state of things, which is the fruitful cause of so many conflicts between the consumers and manufacturers of gas. I cannot help thinking it would be as much to the interest of gas companies as it would be beneficial to the public, that gas, like every other article of trade, should be sold at its true commercial value, and not on a fictitious basis as is now too frequently the case.

HENRY GORE.

9, Islip street, Kentish Town, March 11, 1875.

Danger of Fire in New York Hotels.

Mr James Harrison, Superintendent of Rates and Surveys for the New York Board of Underwriters, has recently examined the hotels in this city with reference to their danger from fire, and in the course of his report to the committee having the matter in charge he says:

"Of the 69 hotels, 24 have frame Mansard roofs, 39 have wooden cornices, 35 have *unsafe gas brackets*, 25 have unsafe steam pipes, 20 have unsafe flues or fire-places, 49 have unsafe laundries or drying-rooms, 51 have uncovered lights in basements or wine-cellars, 25 have repair-shops in the buildings, 32 have unprotected boilers, 26 open elevators. Stairways are all open. Thirty-three of these hotels have four of these several defects. Not one hotel exists of this number but has one or more of these defects. * * I scarcely need call your attention to the fact that these buildings range from five to seven stories in height, with tortuous passage-ways or halls, confusing to strangers under the most favorable circumstances, difficult of access to our fire department, and but few of them provided with appliances for extinguishing a fire, while the sparse provisions that are made would in most instances be useless, having no organized body to use them in case of emergency. We are told that these buildings are carefully watched night and day by competent persons. A sad experience has taught the fire underwriters of New York the fallacy of placing entire dependence upon watchmen, however careful and trustworthy. I submit to you whether a danger removed is not preferable to a danger watched or guarded, however carefully? The corrections of many of these dangerous elements are clearly within the power of the owners or occupants. * * * Our surveyors can only advise; no official power is delegated to them. The general reply to their suggestions is: 'There is no necessity for us to spend this money while we can procure as much insurance as we want at satisfactory rates.' The present building law is not retroactive, and can only affect such buildings as are at present in course of construction or alteration or may hereafter be erected; at least I am led to this conclusion from the fact that no official action on the part of the Building Department has been taken in any one instance, although duly served with every slip known as unsafe issued by this bureau."

St. Gothard Tunnel Air Compressors.

In the case of the St. Gothard Tunnel, dry compressors are employed for furnishing the necessary supply of compressed air, these compressors being constructed on the system of M. Colladon, of Geneva. The sets of compressors employed at the two ends of the tunnel are alike in general construction, but differ somewhat in dimensions and in some points of detail, as well as in the arrangement of the driving machinery. The compressors at Airolo have been constructed in three groups, each consisting of three compressors.

The three compressors in each group have each a cylinder 18·11 inches in diameter and 17·72 inches stroke, and they are driven so as to have a mean piston speed of about 265 feet per minute. These pistons are coupled by connecting rods to a three-row crankshaft, this shaft having its three cranks set at an angle of 120° with each other. The arrangement of bedplate, main bearings, crosshead guides, etc., is neat and substantial.

The leading feature in the Colladon system of air compressors consist in the arrangements made for the efficient cooling not only of the barrel of the cylinder, but also of the piston and piston rod. The cylinder is enveloped in a jacket through which water is made to circulate. The piston and piston rods are made hollow and water is caused to circulate through them.

In addition to the cooling action of the currents of water already mentioned, the air, during compression, is further cooled by the injection into the cylinder of a small quantity of "pulverized" water admitted through suitable injection nozzles in the cylinder covers. The compressors are driven by turbines.—*Sci. Am.*

Resignation of an Efficient Officer.—The Board of Public Works and the city have lost a very efficient officer in the person of John P. Culver. Mr. Culver has resigned his position, and the place is vacant. During the past four years Mr. Culver has had charge of the street surveying and the water works, and under his administration the former work has been well done, while the water works have, from a disorganized system, been systematized and improved until they will compare favorably with any similar works in the country. As the department, which has now no head, is one of the most important in the city, it behooves the Board to be careful in their choice of a successor for Mr. Culver. There are men to be procured who are familiar with the workings of the department, and to whom the important trust can be safely confided. These men should have preference over those who are strangers to the department.—*Jersey City Journal*, April 9.

[We hear since that a gentleman named Dougherty, who was one of Mr. Culver's principal assistants, has been appointed to the vacancy.—ED.]

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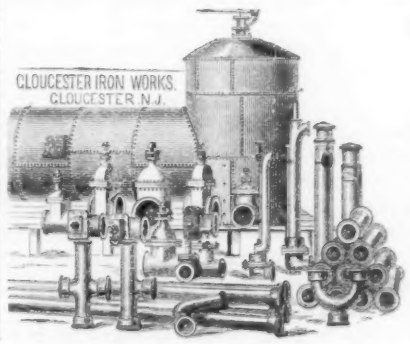

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WEDNESDAY, JUNE 16, 1875.

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THE ASSOCIATION: SUNDAY REST.

On reading the discussion at the late Washington meeting, on the above topic, we should think that some surprise may be likely to occupy the minds of those who have known the prevalent feeling heretofore, on this head, among us.

There has certainly been very generally, and evidently not without strong cause and justification, a belief that the gas-profession and all gas-operatives are under the special dispensation that attaches to *works of necessity*, in relation to the divine institution of a hebdomadal day of rest. Hence there has existed an unquestionable indifference, and even impatience, in reference to the subject. To this journal it has been a source of embarassment. The religious, or even probably the moral aspects of the case we could not discuss, for the obvious reason that these are wholly out of our scope, and would be an intrusion into a domain which, so far as the public is concerned, is totally foreign to the province of a technical journal. We have only been able to fulfill what we deem our duty, by urging the *policy* consideration; that is, that it would be obviously be highly conducive, even in a business way, to a good understanding between the gas interest and the great public—between producers and consumers—to conform, so far as is within the range of possibilities, with the universally prevailing public opinion and faith on this subject.

The cause for surprise we refer to is that obviously the subject *has already* taken hold of the profession, and the impulse that we expected would be given by such men as Messrs. Forstall and Walker, representatives, moreover, of two such great communities as New Orleans and Milwaukee, has even surpassed our expectations. We said before that the good seed had been sown, and would spring up; or words to that effect. It is now plain, that the tree is growing: and we shall feel justified in returning to the subject again and putting in a few words, so far as we may, to help the growth—applying, so to speak, our spade about the roots—in the hope that the fruit may come, in Heaven's good time.

THE EXPERIMENTS AT HARLEM.

It is appropriate to announce now, in advance of a formal and systematic Report, which is in preparation, that the result of the renewed chemical investigation at Harlem, carried on with diligence during the past fortnight, is to confirm to the full the expectations that were entertained. In our last we stated that, in default of the two additional boxes which were contemplated, for the purpose of subjecting the gas to reiterated action of the ammoniacal liquor alone, as separated from the tar in a settling-box, this is now showered down through the gas over the lattice-work, in the "Dry Scrubbers." The Editor's new Analytical Apparatus (figured and described of late in all the Scientific Journals, and in this Journal of January 16, 1875, as exhibited to the Brooklyn meeting of the Gas-Light Association last October) was again erected—in duplicate—at the Harlem Gas-Works; being applied to the gas after passing the St. John and Rockwell apparatus and before entering the purifiers, and to the same immediately after passing the purifying boxes. The general result was that the gas, after leaving the condensing apparatus contains now absolutely no tar and no (condensable) naphthaline, and that its ammonia has been reduced from 2·37 grains per cubic foot, as found last autum, to 1·486 grains, or over 37 per cent. The sulphuretted hydrogen has also been reduced sensibly. This, although the average *temperature* of the gas at this point was found to be about *five degrees Fahrenheit higher* than before. The candle-power of the gas—this time from Murphy-Run coal alone—was, for an actual yield of 5·02 feet per pound, during two days, 17·35 candles; equivalent for a standard yield of 10,000 feet per ton, to 19·4 candles. Full details in the Report, in the next issue.

FURNACE-WORK, WITH PETROLEUM.

The investigation of the splendid operations of Dr. Eames, in Jersey City—referred to in our last—in rolling large boiler-plates from refuse scrap-iron, piled and welded in a furnace heated by a blast of crude petroleum and air; is now in progress. Professor Thurston, of the Stevens Institute, has undertaken to make full tests, with his improved apparatus, of the tensile strength of the petroleum-welded scrap; and the subject is attracting great interest generally among scientific and practical men; which will doubtless be enhanced when the facts are stated with scientific precision, in the Report soon to be published.

MR. FORSTALL'S COMMUNICATION.

Mr. Forstall has *our* thanks, if he values them, as well as those of the profession, assembled at the Washington meeting. In the discussions which led to the establishment of the Association, the argument *pro* was presented, with all the pertinacity that the writer and some few of the profession who were kind enough to agree with him, could muster up, that a medium would in this way be provided—indeed, the only sort of effective and appropriate medium possible—for communications of individuals, to the profession generally, of new experiments and valuable observations, of a scientific, or of a practical kind; or better, of such as combine both science and practice.

The argument *contra* was strongly held, that such an expectation would be disappointed; that the gas-profession in this country was generally too much overtaxed, to spare any time or energy for new observations, or for putting them into such shape as to be presentable to the profession; that their whole ability was absorbed in continually striving to tide over the present, and "make both ends meet." This argument, had and has, force; and we could only beg for a trial of the experiment. It has been tried, and the result is that there are men, like Mr. Forstall and some others, who will crowd out the time and give a corner of their brains to the Work of Progress; the kind of men who *pass into History*, as having done something for the general good. For such men, the Association furnishes not merely a field and an opportunity, but an inducement and an encouragement; lacking which, such important advances as Mr. Forstall has made, and has now, at one step, *spread broadcast over the world*, would be lost; or, at best, would pass into the sum of human attainment but very slowly and by no means surely.

Mr. Forstall has modestly represented his method as merely a return to first principles that had been forgotten, that is to Phillips's original specification. We see no clear evidence of this, and prefer to consider it, as we believe we may, as altogether an original method of Mr. Forstall, discovered by him as the result of patient, ingenious, and intelligent experiment, such as we should be glad to have carried on, to a far greater extent.

INVESTIGATION OF PETROLEUM-GAS.

Since our last, we learn from Mr. Neal, of the Charlestown (Mass.) Gas-Light Company, the Chairman of the Committee appointed by the Association on the subject of petroleum-gas, that as he "understood the action of the Association, no provision was made for any expenditure of money by this Committee in their investigations with regard to this question."

We learn also from Mr. Neal that the understanding was correct, gathered by us from the published proceedings of the meeting that he anticipated no success in obtaining the data for a report which would satisfy the profession, without means to employ and remunerate such skilled *scientific* aid as he deems indispensable in the premises; and that, under present circumstances, he does not anticipate making any report, even of better progress, at the next meeting than at the last, and that the committee still feel desirous of being discharged from the duty of reporting on a subject which they are left entirely without means to investigate.

This is a strange state of affairs; and we can only continue to trust that it may be amply amended at the next meeting; and that Mr. Neal, whose peculiar competency to do this service to the profession, we are as much convinced of as the members generally appear to have been, may then be induced still to serve, and be provided with ample means and authority to order such precise and special investigation as everybody who has properly considered this subject must know to be indispensably necessary.

Much valuable time has already been lost; and we must be allowed to express our own humble opinion, that a deference to the views of those who have given their *special* examination, to any of the numerous problems in the art of gas-making and management which will continue to come up before the Association; and a compliance with the expressed wishes of such; will be found essential to the prosperity of the Association; and that the "evil wrought by want of thought," in such cases as this, may be among the worst of evils.

If the Association is not to provide means for investigations, for the mutual benefit of the members and of the public, we should apprehend a danger of imputations arising, among a portion at least of the public—however unjust such imputations might be—of a narrow and short-sighted parsimony, standing fatally in the way of the attainment of the very objects which the public knows to be held out as those of the Association—objects with which the public rests well-satisfied; but which it will very reasonably expect to be carried out with diligence, energy and efficiency.

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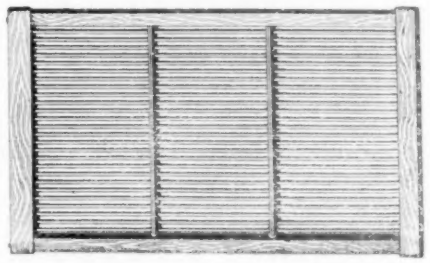

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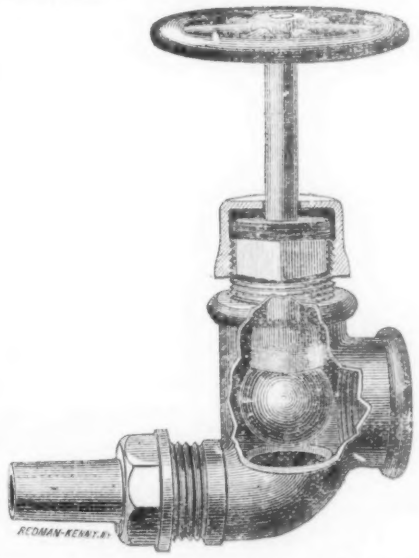

This valve is made of malleable iron, and is specially adapted to encounter the heat of burning buildings, in which the ordinary meter cock (made of brass) will crumble or melt. It is opened or shut with ease, by sliding the stem up or down, the latter being held where desired by the friction of the packing. It is perfectly tight, and is not so liable to get out of order as the meter cock: its cost being about the same.

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Peference is made, by permission, to the following gentlemen, well-known to the gas fraternity—H. Q. Hawley, President Peoples Gas-Light Company, Albany, N. Y.; Isaac Battin, Engineer Albany Gas-Light Company, Albany. N. Y.; F. A. Sabbaton, Engineer Gas-Light Company, Troy, N. Y.; J. C. House, Proprietor Union Gas Works, Lansingburgh and Waterford.

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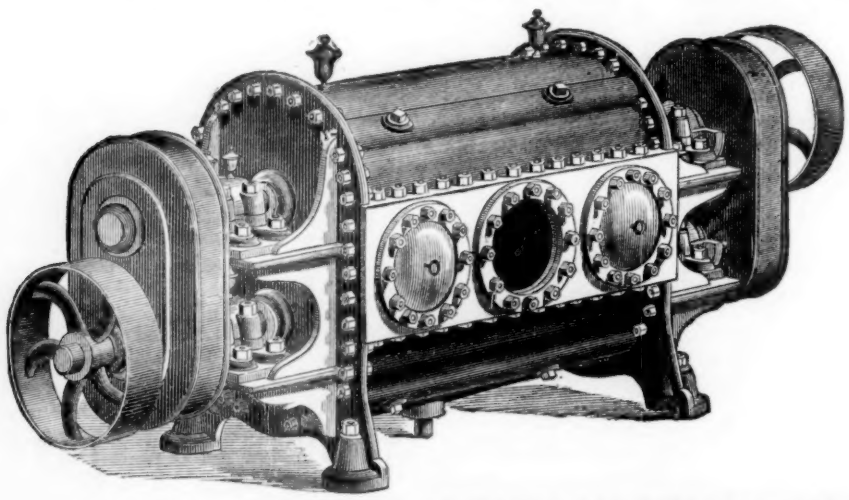

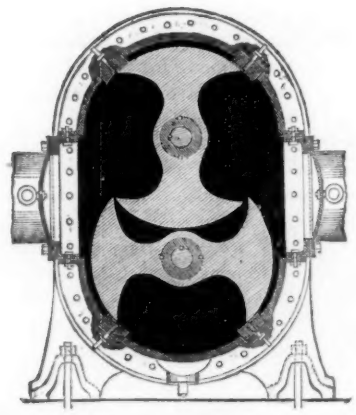

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THE DESPARD COAL COMPANY

OFFER THEIR SUPERIOR

DESPARD COAL

To Gas Light Companies throughout the country.

Agents, PARMELEE BROTHERS, No. 32 Pine street, N. Y.

BANGS & HORTON, No. 31 Duane street, Boston.

Mines in Harrison County, West Virginia.

Wharves Locust Point, Company's Office, 29 South street, } Baltimore.

Among the consumers of Despard Coal, we name: Manhattan Gas Light Company, New York; Metropolitan Gas Light Company, New York; Jersey City Gas Light Company, N. J.; Washington Gas Light Company; Portland Gas Light Company, Maine.

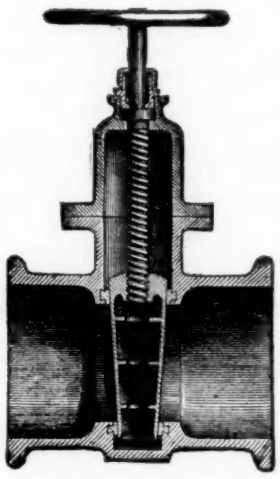
*** Reference to them is requested. 204-1y

CHAPMAN VALVE MANUFACTURING CO.

MANUFACTURERS OF

CHAPMAN GAS VALVES.

Office and Sales Room 75 and 77 Kilby Street, Boston.

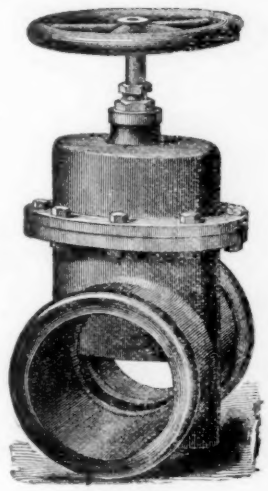


These Valves have been in use for several years, and are pronounced by all who have used them to be

The Best Gas Valves Ever Made.

They afford a direct passage the full size of the pipe. The seats are made of an alloy similar to BABBITT metal, specially prepared for the purpose, and superior to all other metals used for the seats of Gas Valves. It does not corrode under any circumstances to which it is exposed.

There is no LIABILITY OF COHESION between the Gate and Seat, and the Valves can be relied upon to SHUT TIGHT and OPEN EASILY at all times—an important desideratum when used for street mains, in cases of fire.



We refer to the following named Gas-Light Companies among the many that have used these Valves:

BOSTON GAS-LIGHT COMPANY, BOSTON, MASS.
CAMBRIDGE GAS-LIGHT COMPANY, CAMBRIDGE, MASS.
NEWTON & WATERTOWN GAS-LIGHT CO., WATERTOWN, MASS.
LAWRENCE GAS-LIGHT COMPANY, LAWRENCE, MASS.
PEOPLES GAS-LIGHT COMPANY, BROOKLYN, N. Y.
CITIZENS GAS-LIGHT COMPANY, BROOKLYN, N. Y.
SOUTH BOSTON GAS-LIGHT COMPANY, BOSTON, MASS.
CHARLESTOWN GAS-LIGHT CO., CHARLESTOWN, MASS.
LYNN GAS-LIGHT COMPANY, LYNN, MASS.
FITCHBURG GAS-LIGHT COMPANY, FITCHBURG, MASS.
CITIZENS GAS-LIGHT COMPANY, NEWARK, N. J.
WILLIAMSBURGH GAS-LIGHT CO., WIRLIAMSBURGH, N. Y.

GAS AND WATER VALVES ½ INCH TO 36 INCHES DIAMETER.
STEAM VALVES ½ INCH TO 12 INCHES DIAMETER.

357-tf

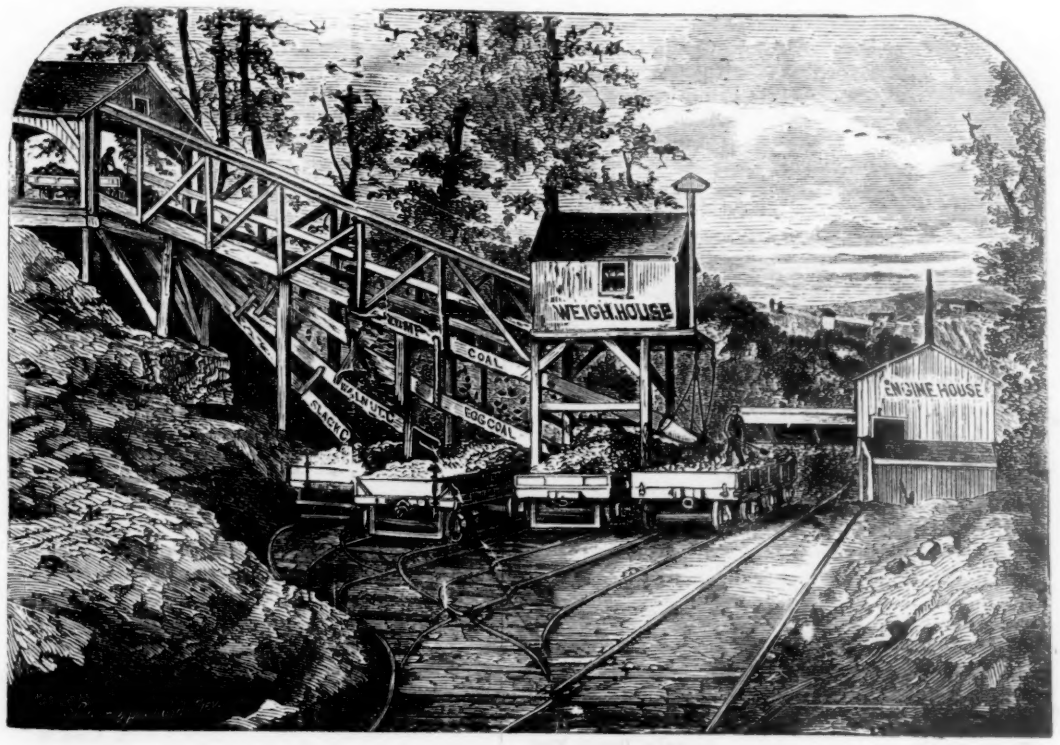
FREEMAN BUTTS COAL ASSOCIATION,

(LIMITED.)

CLEVELAND, OHIO.

CELEBRATED GENUINE STERLING COAL.

American Cannel. Pittsburg and other Gas Coals.



Testimonials.

From Manhattan Gas-Light Co., N. Y.

Yours of the 9th inst. is received. The "Sterling Coal" received from you during the past year worked very satisfactory—averaging 9,500 cubic feet of 15 candle gas per ton of 2,240 lbs., and 41 bushels of coke weighing 1465 lbs. We consider it among the best American Gas Coals for the quantity and quality of the gas produced, and also for the excellent quality of the coke.

I am, gentlemen, your obedient servant,

CHARLES ROOME, Pres't.

From Buffalo Gas-Light Co., Buffalo, N. Y.

The Sterling Coal we have had from you we find to be an excellent gas coal. The yield of both gas and coke is good. The illuminating power of the gas is high and the quality of the coke is very good.

ROBERT ROBSON, Foreman Gas Works.

From Citizens Gas-Light Co.

ROCHESTER, N. Y., Sept. 2, 1874.

Your favor September 2nd at hand. Yield Sterling Coal to date from July 19, 4·70.

Respectfully yours,

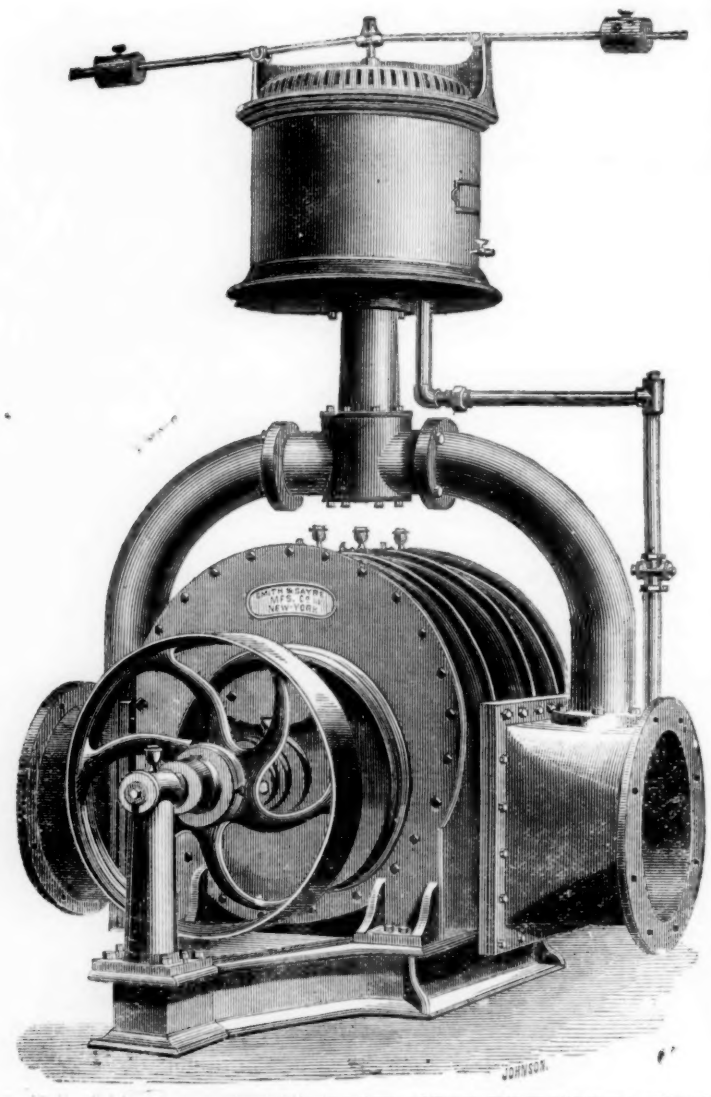
WM. H. WARD, Sec.

Would also refer to the Gas Companies in the following places: New York City (Manhattan and New York Cos), Brooklyn, Albany, Troy, West Troy, Buffalo, Rochester, Oswego, Ogdensburg, Lansingburgh, Newburgh, Rome, Palmyra, Geneva, Yonkers, Rondout, Kingston, Albion, Brockport, Seneca Falls, Elmira and Lyons in State of New York; Cleveland, Toledo, Sandusky, Norwalk, Oberlin, Salem and Fremont in Ohio; Detroit, Ann Arbor, Grand Rapids, Kalamazoo, Jackson and Adrian, in Michigan; Toronto, Hamilton and Coburg in Canada; Chicago, Ill., and two companies in Milwaukee, Wis.

SMITH & SAYRE MANUFACTURING COMPANY.

The Mackenzie Patent Gas Exhauster

And Patent Compensator.



They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-jo ints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

We are also sole proprietors and manufacturers of the

MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary fan. The Cupolas are manufactured in sizes to melt from 1 to 20 tons per hour, will save one quarter of the time required by the old style Cupola and 33 per cent fuel. Address

G. G. PORTER, President.
JAMES M. SAYRE, Treasurer.
CHARLES W. ISBELL, Secretary.
OFFICE, 96 LIBERTY STREET, New York.

SLADE'S
AUTOMATIC FIRE GOVERNOR.

PATENTED AUGUST 4, 1874.

It regulates the speed of Exhausters by controlling the fire. The least pressure on the Retorts opens the Damper in the Boiler Chimney and under the fire, and closes them as soon as the pressure is removed. Saves the boiler, fuel, and all attention, except to supply the fire. Come and see it, or address

JAMES SLADE,
Gas Works, Yonkers, N. Y.

Gas Engineers,

AND PARTIES ENGAGED IN THE BUILDING OF

GAS WORKS,

who desire information regarding PETROLEUM GAS, either or use pure, or for enriching, are requested to address, sta ng particulars.

J. D. PATTON,
363-unl Treverton, Northumberland Co. Pa.

To the Profession.

A YOUNG MAN OF LIBERAL EDUCATION, WHO HAS spent many years in the study of gas, and working in a arge gas works, desires a situation as Superintendent of a works making 10,000 to 50,000 cubic feet daily. Has good reference as to ability; or would act as Assistant in large works. Would prefer a situation on the staff of a gas works uilder—draws well, and has experience in setting up appar-

Address, stating salary, C. P. V., care of W. B. CAR- & Co., Cincinnati, Ohio. 372

P.F. DEILY, J. FOWLER.
1842. *1874.*

DEILY & FOWLER,

39 LAUREL STREET, PHILADELPHIA, PA.,

Builders of Gas Works.

MANUFACTURERS OF

GAS-HOLDERS,

Single and Telescopic.

WROUGHT IRON ROOF FRAMES,
COAL WAGONS,
COKE BARROWS,
AND ALL

Wrought Iron Work

CONNECTED WITH GAS WORKS.

☞ Particular attention paid to Extensions and Repairs.

MASSACHUSETTS
INSTITUTE OF TECHNOLOGY.

Entrance Examinations June 1 and 2, and Sept 23 and 24. For new Catalogue and late Entrance Examination Papers apply to

PROF. SAMUEL KNEELAND,
255-12t Secretary, Boston, Mass.

PRICES OF FOREIGN AND DOMESTIC GAS COALS.

[Reported Expressly for this Journal.]

JUNE 16, 1875.

DELIVERED IN NEW YORK.

English Cannel.			
Ince Hall	$17 00	@	18 00
Kirkless Hall	16 50	@	17 00
English Caking Coals.			
Newcastle Gas	$12 00	@	00 00
Liverpool caking	11 50	@	12 00
British Province Coals.			
Pictou	2 50		
Block House—At Mines, $2 12, Gold	0 00		
Caledonia—At Mines, $2 00, Gold	0 00		
Little Glace Bay—At Mines, 1 87½, Gold	2 00		
Lingan—At Mines, $2 25, Gold	0 00		
Sydney—Old Mine	3 00		
" Reserve Mine	2 2		
" International	— —		

(Duty, 75 cents per ton, gold. Freight to New York $2 2 5 currency. Cost of above coals delivered in New York, $5 25 @ $6 00½, currency.)

Pennsylvania Coals.			
Penn Gas Coal—At Amboy	$7 00	@	0 00
Westmoreland—At Amboy	7 00	@	0 00
(In New York both the above coals $7 50)			
Shafton	7 50	@	0 00
Youghiogheny	7 75	@	0 00
West Virginia Coals.			
MurphyRun	$7 40	@	0 00
Despard	7 40	@	0 00
West Fairmont	7 40	@	0 00
American Gas Coal	7 40	@	0 00
Fairmont	7 40	@	0 00
Newburgh Orrel	7 40	@	0 00
Pinnickinick	7 40	@	0 00
Cloverhill of Virginia	6 00	@	6 50
McKenzie Compound Mixture			— —
American Cannel Coals.			
Peytona of West Virginia	$12 50	@	00 00
Darlington of Pennsylvania			— —
Cannelton Cannel			12 50
Red Bank—at Philadelphia			7 60
" —at South Amboy			9 00
Asphalts.			
Albertite of New Brunswick	$— 00	@	— 66
Ritchie Mineral of West Virginia	18 00	at Balt'e.	
Trinidad Bitumen	— —	@	14 05

The Waverly Coal and Coke Company of Pittsburgh, have contracted with the Pittsburgh Gas-Light Co. for 40,000 tons of their Youghiogheny coal, on private terms,

MECHANICAL & GAS ENGINEER.

To Gas-Light Co's.

The undersigned respectfully announces his voluntary resignation of the Vice-Presidency of the American Meter Company from the 1st of March last, after filling that position from its organization in 1863, and now offers his services as

Consulting or Constructing Engineer,

in the erection of new, or the extension of Gas Works.

He is prepared to furnish plans and Specifications, embracing all the latest improvements in the MANUFACTURE OF COAL GAS, at short notice, and on reasonable terms. His experience of THIRTY YEARS in the construction of Gas and Water Works, Railroads, Tunneling, etc., enables him to refer with confidence to any of the Works erected by him, as a guarantee of satisfaction and ability.

By arrangements with reliable manufacturers of all MATERIAL and SUPPLIES used by Gas Companies, he is prepared to furnish promptly all such orders, with best selections, and to give satisfaction as to prices, terms, etc., and respectfully solicits a share of patronage.

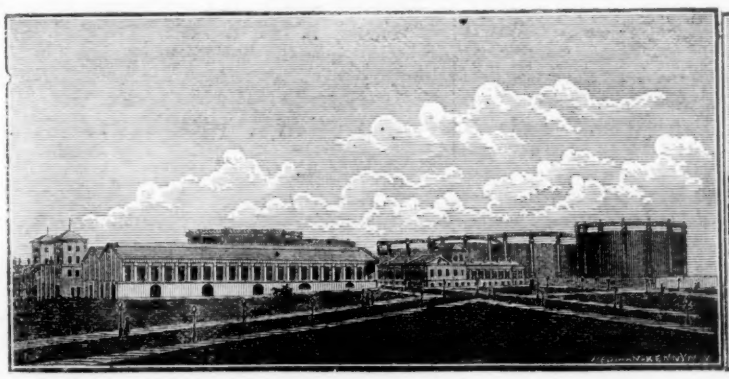
HENRY CARTWRIGHT, Gas Engineer,
2107 GREEN STREET, PHILADELPHIA. 379-6t

KIDD'S
Gas Consumers' Guide

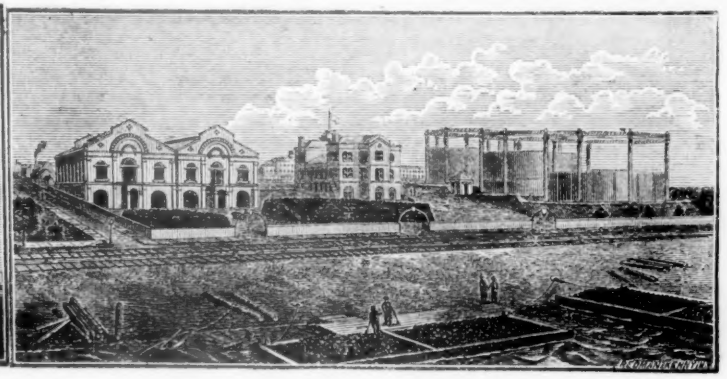
Enables every Gas Consumer to ascertain at a glance, without any previous knowledge of the Gas Meter, the quantity and money value of the Gas consumed. Also the best method of obtaining from Gas the largest amount of its light.

It will be to the advantage of Gas Companies to supply their Consumers with one of these Guides, as a means of preventing complaints arising from their want of knowledge in regard to the registration of their meters. For sale by

A. M. CALLENDER & CO.,
42 Pine Street, New York, Room 18,



CINCINNATI GAS WORKS. ERECTED 1871-72-73.—WM FARMER, ENG.



LACLEDE GAS WORKS, ERECTED 1872.—WM. FARMER, ENG

WILLIAM FARMER,

ARCHITECT AND GENERAL GAS ENGINEER,

111 BROADWAY, TRINITY BUILDING, Room 95, New York.

WILLIAM FARMER may be consulted upon all matters connected with the construction of GAS WORKS, or any other description o buildings W furnish General and Detail Drawings, Specifications and Estimates for Gas Works of any capacity.

PATENTEE OF THE FOLLOWING INVENTIONS:

Exhausters for Gas and Foul Lime Ventilation,
Dumping Barrows for Coal, Coke and Lime,
Hydraulic Mains for Retort Benches,
Blowers for Forges, Foundries, &c.
Pumps for Water, &c., &c.

REFERENCES:

Professor SILLIMAN, New Haven, Conn.
GEN. CHAS. ROOME, President Manhattan Gas-Light Company, N. Y.
A. W. BENSON, President Brooklyn Gas-Light Company, Brooklyn, N. Y.
W. W. SCARBOROUGH, President Cincinnati Gas-Light Company, Cincinnati, Ohio.
S. L. HUSTED, President Laclede Gas-Light Company, St. Louis, Mo.
Prof. HENRY WURTZ, Editor AMERICAN GAS-LIGHT JOURNAL, N. Y.
GEN. A. HICKENLOOPER, Vice-President Cincinnati Gas-Light Co., Cincinnati, Ohio
FREDERICK CROMWELL, Vice-President Laclede Gas-Light Company. St. Louis Mo.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
JAMES R. SMEDBERG, Consulting Engineer, San Francisco Gas-Light Co., Cal.

PATENT FOR SALE.

To Fire Clay Retort Manufacturers.

W. D. CLIFF, of the firm of JOSEPH CLIFF & SON, Wortley, Leeds, England, has recently obtained Letters Patent for the making of CLAY RETORTS by machinery. Besides being made cheaper, they are also made much better than by hand. They are regular and equal in their thickness, and in their length are true and straight throughout, being in all respects far better and handsomer than hand made Retorts. The fact that Messrs. Cliff & Son have for many years been very largely engaged in the making of Clay Retorts will be a sufficient guarantee as to value of the patents. The patentee is wishful to sell the patent right for America. It is No. 55,069, and is for seventeen years from the 15th day of September, 1874.

All particulars may be learned on application to

W. D. CLIFF,
Wortley, near Leeds, England.

580-6t

B. S, BENSON.

MANUFACTURER OF

Cast Iron Pipes and Fittings,

AND

Gas and Water Mains.

All sizes from 3 to 30 inch cast vertically in 12½ feet lengths

Office & Factory 52 East Monument St.,

BALTIMORE, MD.

$30 per Dozen.

DEAN'S

NEW PATENT (1873)

Screening Scoop SHOVEL

FOR COKE, COAL, ASHES, AND OTHER SUBSTANCES.

The frames are 12 by 18 inches, with seven bars, and are made of the best malleable Iron. They can be wired between bars by an arrangement of holes a quarter of an inch apart, by an ordinary person, to screen any size substance desired. They are warranted to be the most durable and practical Screening Shovel made, or money refunded.

Reference—all New York Gas Companies and Hotels.

Price, $30 per Dozen.

Sample sent gratis to any Company, if desired.

☞ Smaller sizes on hand. Please address orders to A. SEE & SON,
N. Y. Shovel Works, No. 1358 B'way, N. Y

FOR SALE.

On or about May 1st, 1875,

One 8 Ft. STATION METER

complete, of American Meter Company's make, with a capacity of four hundred thousand cubic feet per day.

For price and any other information address

H. STACEY, Eng'r and Sup't
Indianapolis Gas-Light and Coke Co.,
Indianapolis, Ind.

375-6t

JESSE W STARR & SON,

Camden Iron Works

Camden, New Jersey,

Philadelphia Office, People's Bank Building, 435 and 437 Chestnut Street.

MANUFACTURERS OF

ALL KINDS OF CASTINGS AND APPARATUS FOR GAS WORKS,

Wrought Iron Roof Frames,

For Retort and other houses Retorts and all castings required for setting them in the latest and most improve model. WASHERS, CONDENSERS, SCRUBBERS and EXHAUSTERS for relieving the Retorts from pressure. PURIFIERS, varyin from 2,000 to 2,000,000 cubic feet daily purifying capacity.

Wrought Iron Lime Sieves

for Purifiers. Station Meters of all sizes.

GAS HOLDERS,

TELESCOPIC AND SINGLE,

With cast iron guide and suspension frames. GAS BRNORS or REGULATORS, STREET MAINS, from 1¼ 48 INCHES DIAMETER, for WATER or GAS. Street Main connections, such as BRANCHES, BENDS, DRIPS, SLEEVES, etc.

STOP VALVES, from 3 to 30 inches, for both Water and Gas.

Wrought Iron Work.

All the Smith and Sheet Iron work required in and abou Gas Works. 226-tf

JESSE W. STARR. JESSE W. STARR, JR.

B. E. CHOLLAR,

GAS ENGINEER,

914 OLIVE STREET, ST. LOUIS, MO.

355-

THE

PENN GAS COAL COMPANY

OFFER THEIR

COAL, CAREFULLY SCREENED,

AND PREPARED FOR

GAS PURPOSES.

Their Property is located in the Youghiogheny Coal Basin, near Irwin's and Penn Station the Pennsylvania Railroad, and on the Youghiogheny River.

OFFICES

No. 11 Merchants Exchange, Phil'a. 90 Wall Street, New York.

PLACES OF SHIPMENT.

Pennsylvania Railroad, Pier No. 2 (Lower Side).
Greenwich Wharves, Delaware River.
366-1y **Pier No. 1 (Lower Side), South Amboy, N. J.**

CANNELTON COAL CO.

OF WEST VIRGINIA.

Offer for sale the following Coals, from their Colliery at CANNELTON, Kanawha County, West Virginia, delivered at RICHMOND, Va.:

CANNELTON CANNEL,

acknowledged to be the most valuable ENRICHER produced in this country, a gross ton yielding 10,000 cubic feet of GAS of **64·54** CANDLE POWER; COKE **32** bushels, of good quality.

CANNELTON SPLINT,

a SEMI-CANNEL of an excellent quality, a gross ton producing **9,500** cubic feet of Gas of **20** CANDLE POWER; COKE, **30** Bushels, fair quality.

CANNELTON CAKING COAL.

Recent experiments made with this Coal have established the fact that the Kanawha Valley can furnish GAS COAL equal to those produced from any other section of the country; that mined by the Cannelton Co. yielding from the gross ton **10,000** cubic feet of Gas of **16** CANDLE POWER **35** bushels of COKE of *superior quality*—only *one* per cent. of *sulphur*.

SAMPLE CARGOES shipped to any required point, on application to the undersigned, from whom full information can be obtained.

J. TATNALL LEA, Treasurer, P. O. Box 1747 Philadelphia.
SALES AGENTS { **PERKINS & JOB,** 27 South Street, N. Y.; 91 State Street, Boston.
H. W. BENEDICT & SON, New Haven.

ARCHER & PANCOAST MAN'G CO.

DESIGNERS AND MANUFACTURERS OF ARTISTIC

GAS FIXTURES,

AND IMPORTERS OF

FRENCH BRONZES & CRYSTAL CHANDELIERS.

67 Greene Street, 68, 70, 72 Wooster St. } Above Broome. **New York.**

RILEY A. BRICK & CO.,

MANUFACTURERS OF

CAST IRON PIPES,

FOR WATER AND GAS.

ALSO,

AS WORKS AND MACHINERY CASTINGS

OF EVERY DESCRIPTION,

No. 112 Leonard Street, New York.

RILEY A. BRICK. JAS L. ROBERTSON

TYRCONNELL GAS COAL.,

MINED IN TAYLOR COUNTY, WEST VA.

Company's Office, 52 S. Gay St., Baltimore.

CHARLES MACKALL, Secretary.

CHARLES W. HAYS, Agent, Room 7, 111 B'way, N. Y.

SHIPPING POINT—Baltimore, Md.

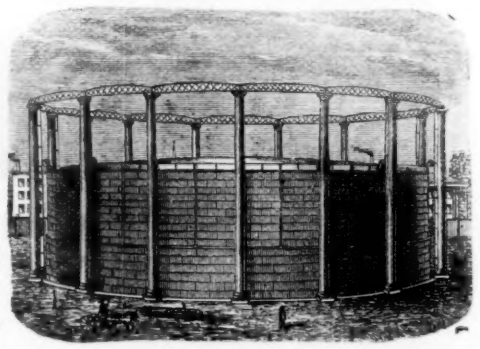
This coal yields 10,000 cubic feet of Gas, with an illuminating power of over 16 candles. Forty bushels of very superio Coke, with little Ash, and scarcely any clinker. 304-1y

T. F. ROWLAND,

Continental Works,

GREENPOINT, BROOKLYN, N. Y.

ENGINEER, AND MANUFACTURERS OF



GAS-HOLDERS

OF ANY MAGNITUDE,

Condensers, Scrubbers, Purifiers, Retorts, Hydraulic Mains and all other articles connected with the Manufacture and Distribution of Gas, furnished with despatch. Plans and Specifications prepared, and Proposals given for the necessary Plans for Lighting Cities, Towns, Mansions, and Manufactories.

MONONCAHELA GAS COAL COMP'Y

Of West Virginia.

OFFICE, 56 EXCHANGE PLACE.
(P. O. Box 432.)
BALTIMORE.

Thomas Gemmell, *President.*
A. Robinson, *Vice-President and Treasurer.*
Benjamin Bissell, *Secretary.*

Mines at Wilsonburg, Harrison Co., W. Va
Shipping Port, Baltimore.

L. S. BOYER & CO,, GENERAL SALES AGENTS.

The result of use of this coal in *quantity* by several of the largest gas works in the country, is reported as follows, viz. Yield of gas, 10,000 to 10,500 feet per ton of 2,240 lbs.; illuminating power, 16½ to 17½ standard candles; coke, good in quantity and quality. 350-3m

THE NEWBURGH

Orrel Coal Company,

Mines at Newburg, Preston County, W. Va.
Company's Office, No. 52 S. Gay Street, Baltimore, Md.
C. OLIVER O'DONNELL, Pres't. CHAS. MACKALL, Sec'y.
CHAS. W. HAYS, Agent in New York, Room 7, Trinity Building, 111 Broadway.
SINCLAIR & AGNEW, Agents, Alexandria, Va.

This Company offer their very superior Gas Coal at lowest market prices.

It yields 10,996 cubic feet of gas to the ton of 2,240 lbs. of good illuminating power, and of remarkable purity; one bushel of lime purifying 6,792 cubic feet, with a large amount of coke of good quality.

It has been for many years very extensively used by various Gas Companies in the United States, and we beg to refer to the Manhattan, Metropolitan, and New York Gas Light Companies of New York; the Brooklyn and Citizen's Gas Light Companies of Brooklyn, N. Y.; the Baltimore Gas Light Company of Baltimore, Md., and the Providence Gas Light Company, Providence, R. I.

The best dry coals shipped, and the promptest attention given to orders. 294-1y

PEYTONA CANNEL COAL

From West Virginia.

Yields over **13,000** feet of Gas per ton. At ten thousand feet (standard yield) the illuminating power s over **43** candles. Purifies **4,510** feet to the bushel of lime.

S. E. LOW, Secretary,
Office, 58 Broadway.

WROUGHT IRON

ENAMELED GAS AND WATER PIPE,

MANUFACTURED SOLELY BY THE

NATIONAL TUBE WORKS COMPANY.

ALSO MANUFACTURERS OF

Lap-welded Steam and Gas Pipe,
Tubing and Casing for Artesian, Oil and Salt Wells (WITH PATENT PROTECTING COUPLING),
Lap-welded Iron Boiler Tubes,
Mack's Patent Injector, Etc.

WORKS AT BOSTON, MASS., AND McKEESPORT, PENN.

OFFICES AND WAREHOUSES.

New York, No. 78 William Street.
Buffalo, No. 216 Main Stree
Chicago, Nos. 112, 114 & 116 Lake Street,
Cincinnati, Nos. 119, 121 & 123 Pearl St.

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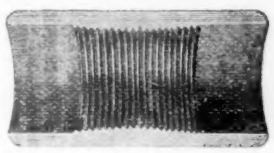

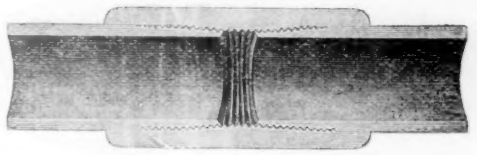

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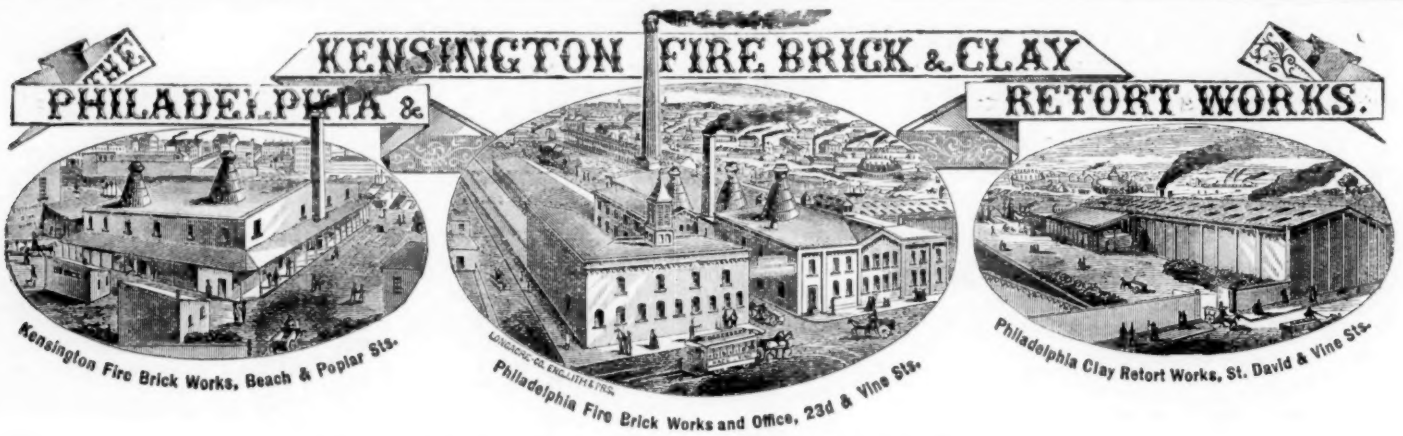
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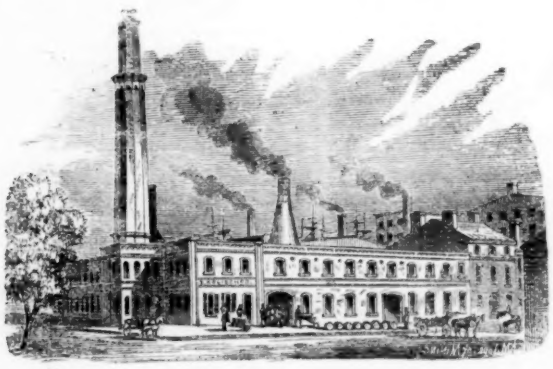

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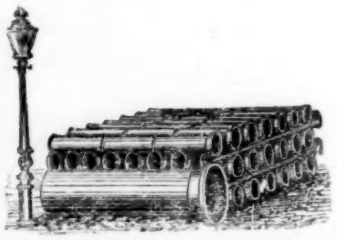

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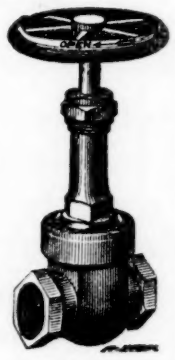

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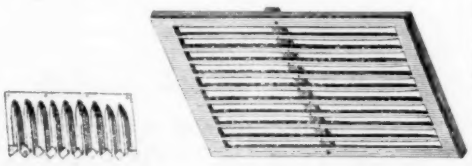

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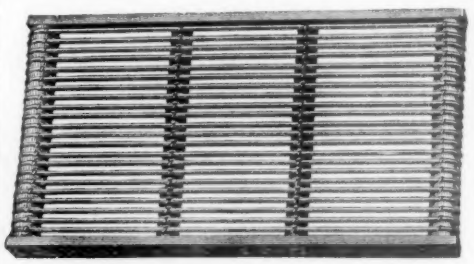

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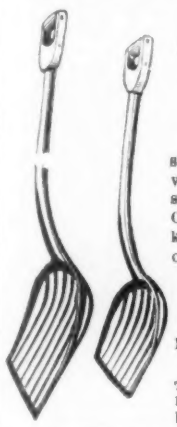

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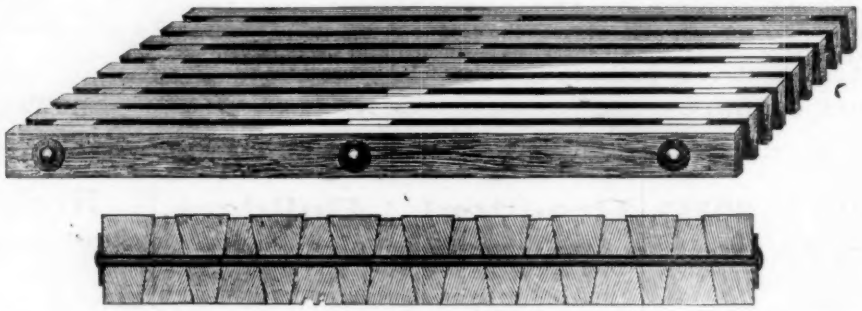

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